DEFENSE INDUSTRY BULLETIN

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ISTANT SECRETARY OF
ENSE-PUBLIC AFFAIRS

IN THIS ISSUE

DEPARTMENTS

Defense Industry Bulletin Starts Second Year of Publication

The first anniversary issue of the DEFENSE INDUSTRY BULLETIN marks a milestone in our continuing effort to assist American industry in responding to Defense requirements. Thousands of readers have told us it serves a useful purpose. I am pleased with this expression of interest and with the steady growth in the BULLETIN circulation.

Through this publication and other channels of information, we shall do everything possible to communicate our policies and plans and keep industry apprised of our needs to accomplish them.

I am encouraged by the increasing cooperation between the Department of Defense and industry, and I am confident that we can work even more closely together in the future. The DEFENSE INDUSTRY BULLETIN is dedicated to this purpose.

Robt S. McNamara

Secretary of Defense

Procurement Counseling To Be Repeated at Advanced Planning Briefings

Procurement counseling and assistance will be offered for those who desire it as part of the 1966 DOD-National Security Industrial Association Advanced Planning Briefings for Industry. Senior procurement specialists from the Military Departments and the Defense Contract Administration Service will be on hand at each regional meeting to discuss specific procurement program interests and problems.

Also available will be current Invitations For Bid and Requests For Proposal aggregating over $100 million, as well as lists of items for which DOD buyers are seeking additional sources. Other informative material on hand will be Secretary of Defense McNamara's "Posture Statement" before the House Armed Services Committee on the FY 1967-1971 Defense Program and the 1967 Defense Budget. Special attention will be given to small business and labor surplus area concerns and the six DOD programs for those firms will be explained.

Joining the Defense Department will be representatives of prime defense contractors, the Department of Commerce and the Small Business Administration, who will be available to discuss subcontracting opportunities and services available to contractors in the technical, management, financial and dissemination of requirements fields.

The 1966 Advanced Planning Briefings for Industry will be held in the following metropolitan areas on the dates indicated:

March	3-4	Sheraton-Boston Hotel, Boston, Mass.
March	9-10	Dinkler Plaza Hotel, Atlanta, Ga.
March	16-17	Sheraton-Jefferson Hotel, St. Louis, Mo.
April	12-13	Fairmont Hotel, San Francisco, Calif.
April	27-28	Sheraton-Park Hotel, Washington, D.C.

Those interested in attending the briefings may obtain additional formation by contacting Mr. Paul Newman, National Security ıdustrial Association, 1035 Fifteenth Street N.W., Washington, .C.

Security Classification "When in Doubt, Find Out"

From time to time contractors have expressed a reluctance to ıestion classification guidance received with a proposal or a conact, or to request elaborations and explanations for fear of an- gonizing the "customer." Proper classification is the touchstone security. To ensure integrity of the system and to reduce security osts to a minimum, it is essential for the contractor to be able identify precisely and accurately the items of information which quire classification so as to figure out what documents and hardare must be classified.

Contractors must rely on the guidance set forth in DD Form 54, "Security Requirements Check List," or on other guidance reeived from the contracting office. When the guidance is not suffiently detailed or clear, the contractor should take steps to obtain arification.

Overclassification and misclassification can be expensive. In acordance with policy established by the Director for Classification Ianagement, Office of the Assistant Secretary of Defense (Adıinistration), contracting officers are responsible for assisting ontractors in elaborating, interpreting and applying classification uidance. As a slogan, the Director for Classification Management ıggests, "When in doubt—find out!"

DEFENSE INDUSTRY

BULLETIN

Published by the Department of Defense

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The purpose of the *Bulletin* i to serve as a means of communicatio between the Department of Defens (DOD) and its authorized agencie and defense contractors and othe business interests. It will serve a a guide to industry concerning offi cial policies, programs and projects and will seek to stimulate thought b members of the defense-industry tea in solving the problems that may aris in fulfilling the requirements of th DOD.

Material in the *Bulletin* is se lected to supply pertinent unclassifie data of interest to the business com munity. Suggestions from industr representatives for topics to be cov ered in future issues should be for warded to the Business & Labo Division.

The *Bulletin* is distributed eac month to the agencies of Departmen of Defense, Army, Navy, and Ai Force, and to representatives of indus try. Request for copies should be ad dressed to the Business & Labo Division, OASD/PA, Room 2E81 The Pentagon, Washington, D.C 20301, telephone, OXford 5-2709.

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Changing Patterns in Management Theory

by

Maj. David I. Cleland, USAF
Maj. David C. Dellinger, USAF

The advancement of technology in all phases of industrial and military management since World War II has forced radical innovation in management theory and practice. In the Department of Defense the acquisition and development of weaponry has become a management problem of extraordinary proportions. Changing roles and missions of the military establishment and the increasing acceleration in the conception and development of weaponry have fostered the creation of unique and challenging approaches to the management process, approaches which cut across the neatly defined road maps of management theory. Similar and equally radical changes have occurred in the defense industry. There has been a tendency in the development of this approach for writers and practitioners to support their own ideas by downgrading or misrepresenting what others have contributed. The result has been some confusion regarding the management discipline.

This article will critically analyze the so-called "qualitative"—"quantitative" dichotomy that has evolved in management thought and theory in recent years. The analysis will be performed in the context of the management roles involved in the development, acquisition and employment of weaponry.[1] A brief resume of historical and contemporary management thought will serve as a conceptual foundation, even though such a foundation can only be offered at the risk of severe oversimplification of a complex subject.

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The Evolution of a Management Discipline.

Within this century there has developed in the United States a thriving economy, fostered by a dynamic revolution in technology and management thought. The professional manager has influenced all sectors of our society by providing skill in the management of human and non-human resources. Problems have confronted military and industrial leaders since antiquity, and various techniques of management have existed since the beginning of man's efforts to form organized groups for attaining mutual objectives. The systematic examination of management thought, and the development of a discipline devoted to codifying principles and developing a theory has been, for the most part, a product of the twentieth century. Management has long been recognized as an art, but only in the present century has scholarly interest developed in the designing of a conceptual framework for the teaching and practice of management.

The conceptualization of management theory in its modern meaning has a firm reference in the writings of industrialist Frederick W. Taylor early in the present century. Taylor's classic treatment about management as "knowing exactly what you want men to do, and then seeing that they do it in the best and cheapest way" introduced an era of scientific management at the shop level. Taylor was mainly concerned with the efficiency of workers and managers in actual production positions in the factory. This preoccupation at the operating level probably caused practitioners and scholars to neglect the problems of management at higher levels in the organizational structure. Koontz and O'Donnell at the Graduate School of Business Administration, University of California, Los Angeles, credit Henri Fayol, a French industrialist with being the father of modern management theory. Fayol's now classic book, "Administration Industrielle et Generale," published in 1916, was not translated into English until 1929; no English translation was published in the United States until around 1949.[2] Fayol's book presented a clear and perspective view of the management process. His examination and treatment of the organic functions of management are, in the main, still valid several decades later. Others have made contributions to the development of management principles and theory; yet the work of Taylor and Fayol remain as "classics" in the annals of management thought and theory.

The Meaning of Management.

Management is a distinct process or activity concerned with the achievement of objectives. It may be expressed in a number of different ways, viz., ". . . the task of creating the internal environment for organized effort to accomplish group goals. In coordinating group activity, the manager plans, organizes, staffs, directs and

[1] *Weaponry has an identifiable life cycle, viz., four phases: conceptual, definition, acquisition and operations. This life cycle begins with an idea or concept, progresses through definition and production and ends when the weapon or system is retired from the operational inventory of the Military Department.*

[2] *Koontz, Harold and O'Donnel, Cyril "Principles of Management," (McGraw-Hill Book Company, 1964), p. 17.*

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controls."[3] Ralph C. Davis of the Ohio State University defines management as ". . . the function of executive leadership anywhere."[4] The USAF defines management as the process of organizing and using resources to accomplish predetermined objectives.[5] Other definitions of management express fundamentally the same thought as reflected above. Throughout most definitions of management one finds certain universal elements, viz.,

- Management is a distinct process dealing with group activity.
- An objective is involved.
- The objectives are achieved through establishing salient relationships between human and non-human resources.
- Management necessitates that the manager relinquish the tendency to perform things for himself and accomplish objectives through working with others in the group situation.
- Decision making is pervasive in the management process.

Analysis of these elements indicates that considerable agreement exists concerning the functions and nature of the management process. This indicates a sense of maturing in the discipline with promise of the development of a scientifically based philosophy of management. The disquieting force in management theory today is the variety of approaches which are appearing from parochial areas. There are tendencies to formulate distinct approaches to management thereby neglecting the inter-disciplinary nature of the management process. The various approaches or "schools" of management theory include:[6]

The Traditional School. Founded by Henri Fayol, this approach highlights the management process of getting things done through people in organized groups. By analyzing the management process and identifying the underlying principles, a theory of management is formulated. Management is viewed as a universal activity by this group with the principles thereof holding true whether the group be a business, government, military, or other organization. This school deals principally with the organization aspect of the management process, although in later years the management functions were analyzed and dissected. Scholars in this field have some disagreement concerning the various organic functions of the manager; however, there is nearly complete agreement that planning, organizing and controlling are the primary functions of the manager. The traditional school centers around these ideas:

- Organizations function as an integrated entity on a vertical basis.
- A strong superior-subordinate relationship is required to preserve unity of command and to ensure unanimity of objective.
- Individual functional managers are parochial (and rightly so).
- Functional managers maintain lateral staff coordination to obtain integrated staff action.
- Organizational groups have a basic dichotomy, *viz., the line* and *the staff*.
- A scalar chain of authority relationships exist within the organization ranging from the ultimate authority to the lowest rank with the line of authority following every link in the chain.
- An employee should receive orders from one superior only.
- Work progresses among relatively autonomous functional units of an organization.

Human Behavior School. During the early days of the founding of the management discipline, primary emphasis centered around scientific management at the shop level. The employee was viewed as an instrument of employment to be utilized as efficiently as possible in production. The scientific selection and training of workmen, the establishment of optimum work quotas and the neglect of the human element of management caused a revisionist movement in the period following the 1929 depression. This movement revolutionized management thinking by focusing attention on the elements of job and work satisfaction as related to the human relations part of employment. As described by Keith Davis, Professor of Management, Arizona State University, ". . . human relations is the integration of people into a work situation that motivates them to work together productively, cooperatively and with economic, psychological and social satisfactions."[7] The human behavioral view of management places heavy emphasis on the interpersonal relations that exist in the management situation and is heavily oriented in the theories presented by the psychologists and sociologists. Perhaps more so than the traditional school, this approach is based on the thesis that managing is getting things done through people with the primary focus resting in the motivating function of management.

The Mathematical School (sometimes called "quantitative" management). This school includes those theorists who emphasize the use of mathematical models in managerial decision making. The best known group comprising this school include the operations researchers and management scientists who emphasize quantitative analysis in decision making. This group supports the idea that the essence of management is decision making, a process which can be expressed in terms of mathematical symbols and relationships. Mathematics then logically has a place in management through the requirement for objectivity and abstract reasoning. To label this school mathematical, however, is actually a misnomer as indicated in Professor Koontz's observation that:

> "There can be no doubt of the great usefulness of mathematical approaches to any field of inquiry. This type of approach forces upon the analyst the definition of a problem or problem area; conveniently logical methodology—developed by years of scientific application and abstraction—furnishes a powerful tool for solving or simplifying complex phenomena. But it is even harder to see mathematics as a truly separate school of management theory than it is to see it as a separate school in physics, chemistry, engineering, or medicine."[8]

Even though one could hardly argue that the mathematical approach constitutes a form of management, quantitative analysis properly occupies a strong position in the management process.

The Systems Approach. This most recent school opines that traditional management philosophy is pervaded with vertical flow of authority and responsibility relationships and emphasizes parts and segments of the organization. According to the systems school the traditional approach does not place sufficient import on the inter-relationships and integration of activities involved in the total array of components of the management system. The systems concept provides a *way of thinking* about the management process. It presents a theoretical framework for viewing the internal and external environmental factors as integrated into the whole. Explicit in this concept is the interdependency of decisions between all parts of components of the management problem. Such awareness of the system inter-

[3] *Ibid, p. 1.*

[4] *Davis, Ralph C., "The Fundamentals of Top Management," (Harper & Bros., Publishers, New York, 1951), p. 6.*

[5] *Air Force Manual 25-1, Oct. 15, 1964, p. 2.*

[6] *Several authors have described the schools of management theory. The article, "Making Sense of Management Theory," by Harold Koontz, Harvard Business Review (July–August 1962), is a primary source of material for the ensuing discussion of the "schools" of management. However, responsibility for the addition of the systems school in the present article belongs to the authors.*

[7] *Davis, Keith, "Human Relations at Work," (McGraw-Hill Book Co., Inc., 1962), p. 4.*

[8] *Harold Koontz, pp. 35–36.*

dependency discourages provincial decisions.

Each of the schools have their place in any management situation but vary in emphasis depending upon the particular environmental conditions that are encountered. One of the most provocative areas of management is that of developing a modern weapon system. In this environment is found the project manager* (or systems manager), a manager that is confronted with a unique set of circumstances and forces that channel his thought and behavior into somewhat singular patterns of response.

Today's project manager is facing an interlaced sequential managerial activity encompassing broad spectrums of authority and responsibility. The complexity of management relationships cause vast resources to be exhausted before retrenchment or redirection can be effected.

Change has become a normal way of life and the increase in the rate of change has vastly complicated the manager's decision problems. The number of alternatives which are open for consideration in the selection of weaponry have increased at a phenomenal rate and the consequences of error have become profoundly serious.

Experience alone has proven inadequate for coping with these rapid changes; managers have been forced to develop better methods for making and executing decisions. The development of electronic computers has made it possible to rapidly process and manipulate large quantities of data and has made it feasible to conduct quantitative analysis heretofore impractical. The introduction of quantitative analysis into management processes has manifestly changed the way we think about the management task. Managers in industry and Government are beginning to recognize the tremendous potential of the computer and the quantitative tools of the operations research as aids in the decision process.

There is some evidence to indicate that a cleavage has developed between those who belong to the earlier mentioned Mathematical School and the other schools of management, primarily the Traditional School. The terms qualitative and quantitative managements have been used to indicate these two schools. It is the thesis of this article that a view of management which does not combine the contributions of these two schools in the management process is erroneous. One does not have the simple alternative of being either a qualitative manager or a quantitative manager. To formulate a philosophy of management on this basis can easily lead to the unfortunate impression that the question is one of utilizing either quantitative analysis or qualitative analysis in the management function. Such is not the case. The difference which should be emphasized is neither one of methodology nor point of view, but rather the particular aspects of the managerial problems and the degree of analysis essential to the management task.

The manager's job can be viewed as a two-step process; (1) deciding what should be done and (2) assuring that actions are taken to effect the decision. For convenience, these steps can be designated *the decision process* and *the execution process*, respectively. It is quite clear that the manager must assume responsibility for both these processes. To perform only one would accomplish something less than the total management job required. The portion of the total management job comprising each of these processes varies with the job. In large highly centralized organizations, lower level managers are not given authority to make major decisions; their jobs are primarily concerned with execution. Their decisions are likely to be such that little analysis is required; experience and policy direction provide an adequate guide to decision making. Conversely, higher level executives in large organizations depend upon an administrative apparatus for the execution process and concentrate their attention on long-range planning and on critical and comprehensive decisions. Experience itself is often an inadequate basis for decision making on the level; the process must be supplemented with analysis. Perhaps a better way of saying it is that experience and judgment must be integrated into an analytical framework to complement the decision-making process.

The Mathematical School or quantitative managers concern themselves with analysis for decision making almost entirely. They emphasize the use of a formal analysis and the use of computer technology, mathematical models and related techniques in the decision process. Members of the traditional or qualitative school address themselves to the entire management problem, *i.e.*, both the decision process and the execution process, but emphasize the execution process, possibly to the neglect of the decision process.

Decision making has been an integral element of management literature appearing in the first half of this century; increased momentum in decision theory in the last 20 years has centered around the emergence of adaptable and sophisticated tools of mathematics and statistics. The most vital decisions are nonrecurring; Peter Drucker has explained these vital decisions in this manner:

> "The important decisions, the decisions that really matter, are strategic. They involve either finding out what the situation is, or changing it, either finding out what the resources are or what they should be. These are the specifically managerial decisions. Anyone who is a manager has to make such strategic decisions, and the higher his level in the management hierarchy, the more of them he must make."[9]

Strategic decisions are unique as compared to routine decisions through the involvement of forces of (1) high degree of risk and uncertainty; (2) critical elements of futurity; (3) heavy committment of human and non-human resources; and (4) manifestly affecting the organization's competitive position.

Traditional theory has, in the main, approached decision making from the basis of five distinct phases:

- Defining the problem.
- Analyzing the problem.
- Developing alternate solutions.
- Deciding on the best solution.
- Converting the decision into effective action.

Each phase of the foregoing has several steps. What traditional theory has failed to do is provide a rigorous definition of framework for analysis, to establish criteria to assess unknowns and to require the logic and methodology of mathematics.

A philosophy of management which considers quantitative and qualitative as two separate and distinct forms of management not only is erroneous and misleading but indicates a serious misunderstanding of the management process. To say that the *quantitative manager* considers only the quantitative aspects of management problems and that the *qualitative manager* evaluates just qualitative aspects of management is illogical. Management problems just don't come with their salient issues neatly divided in this manner; any aspect can be treated (perhaps inadequately) from either quantitative or qualitative methodology. The very essence of the managerial decision process is that of determining how to treat the various aspects of the problem and what interrelations exist between them. *If there is a meaningful issue between these schools, it is the question of the depth of analysis and methodology required for adequate decision making.* Traditional management

* *Note: The project manager is an extraordinary individual in the Defense industry establishment; he may simply be defined as that individual who is appointed to accomplish the task of integrating functional and extra-organizational efforts directed toward the development and acquisition of weaponry. For a discussion of the role and mission see "The Project Manager—Manager Extraordinary,"* Defense Industry Bulletin *(May 1965).*

[9] *Drucker, Peter F., "Practice of Management," (Harper & Bros., Publishers, New York, 1954).*

theory has not emphasized analysis to the depth which can be realized through the use of mathematical logic. While traditional theory does advocate analysis, it is an analysis which is based largely on experience gained in similar situations.

This is quite different from the view of analysis which a *quantitative* manager would take. As will be discussed subsequently, he would advocate a tailored analytical structure for each decision and the use of any of a number of techniques as applicable to the particular problem. Traditional management theory has its roots in a time period when the rate of change in the environment was relatively low compared to contemporary and recent past times, when it was not practical to emphasize analysis in depth for decision making. The theory of analysis was not developed to the extent that non-mathematicians could apply it, nor were computers available to economically process the immense amount of data sometimes required to make analysis in depth feasible. Moreover, the decision problems did not generally require the depth of analysis. Experience alone did provide an adequate basis for more discussion. This is not the case today and the industrial-Defense manager must develop a philosophy to keep pace with the challenge of contemporary management problems.

In the following sections, traditional management theory with its recent innovations is discussed to illustrate the emphasis on the execution process and the views of the mathematical school are portrayed to illustrate its emphasis on the decision-making process. Finally, the two approaches are combined to indicate the interdependency of both approaches in the total management job.

Looking at the traditional framework of management, one finds that what the manager does is fundamental and universal in its application regardless of the type of organization involved be it military, ecclesiastical, industrial, or even illegal. All man- [illegible] their level in an [illegible] m certain basic [illegible] ward the accomp- [illegible] predetermined goal or objective. Management has both the elements of an art and a science. As an art it requires skill in performance acquired through experience. As a science, management is furthered by knowledge which has been systematized and formulated through the discovery of general truths or principles. Science and art in the management discipline are complementary; they are not mutually exclusive in the management process. One may, however, have a sound theoretical knowledge of management yet fall in performance as a manager because of lack of proficiency in the *art* of the discipline, particularly when the management process requires close and continuing contact with people.

Management is a distinct field of knowledge and skills apart from technical skills such as engineering, accounting, production, procurement and the many other skills found in complex organizations. Today's manager should be vitally concerned with continuing the development of an underlying theory or philosophy of management in order to provide a broad framework for the making and execution of decision in the complex military-industrial environment. The cornerstone of traditional management theory is principles; these fundamental maxims explain certain phenomena and constitute the framework around which a theory is built. Some of these principles are easily recognized through the observation of management experience, while others are still in the state of an hypothesis, requiring verification and codification.

Occasionally one finds examples where a principle is disregarded in practice. For example, the hasty critic may point to dual subordination in an organization and come to the erroneous conclusion that there is no substance or validity in the principle of unity of command.[10]

Functions of the Manager.

Management was described earlier as a distinct skill apart from the technical skills involved in an organization. It is composed of identifiable functions or homogeneous activities that are integral to the management process. While some disagreement exists among current academicians and practitioners, abundant evidence reflects that a manager accomplishes the *planning, organizing* and *controlling* of human and non-human resources. Planning, the most abstract of these functions, involves the determination in advance of what should be done, by whom and when the performance should be accomplished. Organization has to do with the procurement of human and non-human factors, the grouping and alignment of personnel and equipment and the delegation of authority and responsibility within the organizational structure.

Study of the organizing process includes recognition of the more complex system of informal relationships which exist in any group activity. Informal organization is that network of personal and inter-social relationships existing along with the formal organizational structure but [illegible] quired or identified in the unit [illegible] mentation. The informal org[illegible] tion emphasizes people and th[illegible] they have as granted by their [illegible] whereas formal organization [illegible] sizes functions, positions and [illegible] grants of authority and respo[illegible] ity.[11]

Controlling has to do with [illegible] events conform to plans, i.e., co[illegible] ting the action of all parts [illegible] organization according to th[illegible] which has been established f[illegible] attainment of the objective. The [illegible] ager performs all these fun[illegible] somewhat continuously. They ar[illegible] formed regardless of the org[illegible] tional level but with differen[illegible] phasis being placed on each fun[illegible] depending on the level withi[illegible] organization. The operational [illegible] ager, for example, who is ch[illegible] with responsibility for the accom[illegible] ment of a specific mission, is [illegible] concerned with the control func[illegible] he approaches the point of p[illegible] mance of the mission itself. A [illegible] official, on the other hand, w[illegible] charged with the development o[illegible] overall plan, is more involved wit[illegible] planning function than with org[illegible] ing or controlling.

Authority and Responsibility Patt[illegible]

A discussion of management [illegible] is not complete without an exami[illegible] tion of the responsibility and aut[illegible] ity patterns involved in the man[illegible] ment relationship. Authority [illegible] responsibility constitute the [illegible] framework of management. Auth[illegible] ity is defined as the right der[illegible] from some legitimate source to [illegible] the efforts of others in a com[illegible] endeavor. It is the power to act [illegible] mate formal authority as delegat[illegible] the military establishment flows f[illegible] the Constitution through various h[illegible] archical levels to the local milit[illegible] commander. This is legal autho[illegible] which attaches to an organizatio[illegible] position and provides an import[illegible] source of power. Such authority d[illegible] not, however, give a superior [illegible] right to make decisions and command in an absolute sense. It does provid[illegible] important penalties and rewards [illegible] the form of promotions, job assi[illegible] ments, etc., which have the effect [illegible] real meaningful power over the su[illegible] ordinates.

In the long range effort, however, a manager must have that authority which comes to him the acceptance [illegible] respect which his ability [illegible] for him. Only formal authority [illegible] be delegated; one cannot delegate influence. All that can be done is [illegible] assure that the manager has the environmental conditions which [illegible]

[10] *Derivation of the unity of command principle, i.e., an employee should receive orders from only one superior, is credited to Henry Fayol. Doubtlessly, this principle can easily be upheld in a small organizational arrangement where the management process operates solely through superior/subordinate relationships. In today's large organizations, particularly in the acquisition and employment of weaponry, the management of a project or a task force cuts across many different organizations, thus casting some doubt about the universality of this principle.*

[11] *See "Human Relations at Work" by Keith Davis (McGraw-Hill Book Co., New York, 1957) for an excellent discussion on the phenomenon of informal organization.*

(Continued on Page 1[illegible]

ity, fixed price contracts were awarded by BUSHIPS in September 1964 for the insertion/injection ships and in March 1965 for the reentry ships.

Thus, three "Mission Class" tankers from the Maritime Administration reserve fleets are being converted by General Dynamics/Electronics at the General Dynamics/Electric Boat shipyard in Quincy, Mass. These conversions include jumboization of the hulls, reactivation and repair of machinery plants and installation of technicians' quarters and instrumentation facilities in the new mid-bodies along with three lounges, a physical training room, workshops, a hobby shop and a library. There also are storage facilities for repair parts and equipment, conference rooms, briefing rooms, offices, photographic laboratories and all the normal hotel facilities essential to the mission.

Originally named Mission San Fernando, Mission San Juan and Mission De Pala, the ships will be renamed USNS Vanguard, USNS Redstone and USNS Mercury, respectively, after United States space programs, and bear T-AGM-19, T-AGM-20 and T-AGM-21 hull numbers.

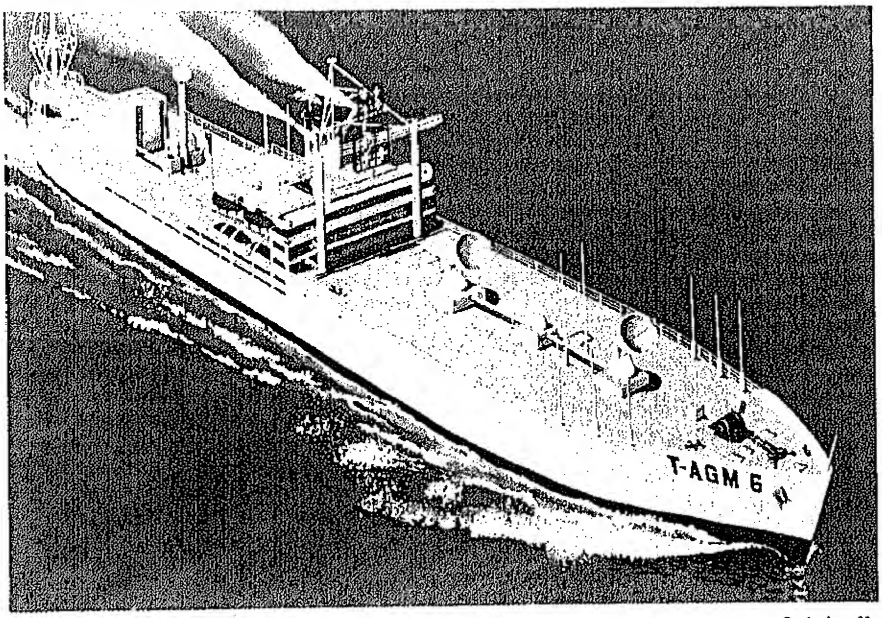
The first ship, Vanguard, was floated from its building dock on September 9, 1965. It should have trials by the Navy's Board of Inspection and Survey in February 1966 and complete instrumentation tests by mid-June. Redstone and Mercury will follow at three-month intervals.

Two existing range instrumentation ships, USNS Watertown (T-AGM-6) and USNS Huntsville (T-AGM-7), were converted originally from Victory ships and are being modified to reentry ships by Ling-Temco-Vought's Range Systems Division at Avondale Shipyard in New Orleans, La.

Instrumentation installations and mission support capabilities of the 15 other range instrumentation ships vary considerably among the ships. When modification of a ship is required to meet operational needs, the project office coordinates translation of the outline requirements provided by the range into the detail specifications, contract plans and contract guidance plans needed for a competitive, fixed price procurement. Compared to the five Apollo instrumentation ships, work scope is much less on this type of project, but all elements of the pre-procurement cycle are present.

While the focus of liaison and Navy endeavor relating to a specific ship project is ISPO's project engineer, under the project manager, the project office has neither the manpower nor the versatility to produce the design package, perform the contracting function, monitor contractor performance, or accomplish the profusion of other tasks required for successful ship delivery. The wide experience in shipbuilding and diverse talents of the existing functional organization of BUSHIPS and its field activities are utilized, each element contributing its part to the whole in accordance with traditional shipbuilding practice. In addition, important contributions to the design package are made by instrumentation engineers of the Pacific Missile Range, a field activity of the Bureau of Naval Weapons.

Employment of existing elements of the Naval Material Support Establishment (NMSE) to fulfill the mission of the Instrumentation Ships Project was specified in the project charter. The spirited cooperation, technical excellence and prompt response to ISPO tasks by personnel of these diverse organizations are responsible for the success of this Chief of Naval Material Designated Project.



Drawing of the Range Instrumentation Ship USNS Watertown. Originally converted from a Victory ship, the new vessel is being modified to support the U.S.'s Apollo mission.

Main Battle Tank Contract Awarded

The U.S. Army signed a $43,728,000 contract with General Motors Corp., of Indianapolis, Ind., Dec. 16, for the completion of development work on the United States/Federal Republic of Germany Main Battle Tank Program (MBT).

Negotiations leading to the current contract were based on design, configuration and major component selection decisions announced last June by the defense heads of both countries.

This successful contracting effort guarantees uninterrupted progress for the new Main Battle Tank and marks a major milestone in the life of this unique, international development effort.

The contract provides for $11.7 million of the award to go to two subcontractors: Continental Aviation & Engineering Corp., Detroit, Mich., for a high horse power engine; and National Waterlift Corp., Kalamazoo, Mich., for a new type suspension system.

General Motors was selected as the American contractor in July 1964 and to date, has completed its contribution to the initial phases of the MBT program. The current contract covers Phase III, which terminates with the fabrication of pilot models as provided under the basic agreement between the United States and the Federal Republic of Germany signed Aug. 1, 1963

ICAF Renames Correspondence Course

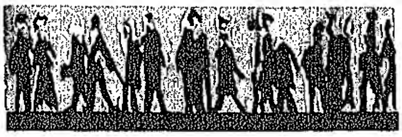
The Industrial College of the Arme[d] Forces correspondence course has [a] new name—"National Security Man[-]agement." Effective Dec. 1, 1965, th[e] old title of "The Economics of Na[-]tional Security" was dropped and th[e] new one adopted.

The new title is considered mo[re] descriptive of the material presente[d] and reflects more vividly the intent [of] the course, which is to create a bett[er] understanding of the manageri[al] aspects of national security.

The Industrial College is also unde[r]taking a major revision of the cour[se] to bring it in line with resident cour[se] revisions. This will proceed on a co[n]tinuing basis over several years a[nd] will result in the introducton of [a] number of new texts and revision [of] the remainder.

Change in the name of the cour[se] or planned revisions will not alter t[he] present system of awarding retenti[on] and retirement points to reservists.

Inquiries about the corresponden[ce] course should be addressed to t[he] Commandant, Industrial College [of] the Armed Forces, ATTN: Corr[e]spondence School, Fort Lesley J. M[c]Nair, Washington, D.C.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Dr. James M. Bridges, Special Asst. for Command and Control to the Dir., Defense Research & Engineering, retired on Dec. 30, 1965.

Jack L. Stempler has been appointed Asst. to the Secretary of Defense (Legislative Affairs). He replaces David E. McGiffert, who was sworn in as Under Secretary of the Army on Nov. 30.

The Advanced Research Projects Agency has selected Maj Gen. Charles J. Timmes, USA, to succeed retiring Maj. Gen. R. H. Wienecke, USA, as Dir., Remote Area Conflict (Project AGILE).

RAdm. Ira F. Haddock, SC, USN, former Asst. Chief of the Bureau of Supply & Accounts for Supply Management, Department of the Navy, has become Commander, Defense Construction Supply Center, Columbus, Ohio. He succeeds Brig. Gen. Robert H. Herman, USAF, who has retired.

DEPARTMENT OF THE ARMY

Maj. Gen. Donald V. Bennett succeeds Lt. Gen. James B. Lampert as Superintendent of the U.S. Military Academy at West Point.

Maj. Gen. Alexander D. Surles, Jr., has relieved Maj. Gen. Andrew J. Boyle as Commanding General, Armor Center, Fort Knox, Ky.

Maj. Gen. Frank A. Osmanski has been assigned as Deputy Commanding General, Army Supply and Maintenance Command, and Chief, Army Materiel Command Operational Readiness Office.

The U.S. Army Mobility Command has appointed Dr. Ernest N. Petrick as chief scientist at MOCOM Headquarters, Warren, Mich.

Brig. Gen. Elias C. Townsend succeeds Maj. Gen. Charles F. Leonard, Jr., as Commanding General, U.S. Army Intelligence Command, Fort Holabird, Md.

Brig. Gen. William B. Latta has been assigned as Commanding General, Army Electronics Command, Fort Monmouth, N.J. His previous assignment was as Deputy Chief of Staff for Communications and Electronics, North American Air Defense Command and Continental Air Defense Command.

Brig. Gen. Walter B. Bess is new Commanding General for the vast European network of signal facilities of the Army's Strategic Communications Command.

Col. Wyatte G. Trainer became Comptroller in the Office of the Chief of Engineers on Jan. 3. He succeeds Col. Cecil H. Fuller, who has retired. Col. Remi O. Renier has been assigned as Dep. Div. Engineer, New England Div., U. S. Army Corps of Engineers, Waltham, Mass. to succeed Col. Edward J. Ribbs, who plans to retire early in 1966.

Col. Lawrence R. Klar, former Chief of the Objectives Div., Defense Communications Agency, has been named new head of the Equipment Applications Directorate of the Army's Strategic Communications Command. He relieves Col. J. G. Moak, who is the command's new Chief of Staff.

Col. William J. Durrenberger, Commanding Officer, Springfield Armory since July 1963, has assumed command of the Army Tank Automotive Center, Warren, Mich. He succeeded Col. Henry Davidson, Jr., who has retired.

Col. Morton M. Jones, Jr., has joined the Army Mobility Command, Warren, Mich., as Project Manager for General Purpose Vehicles.

Command of the Army Research Office-Durham, N.C., has been assumed by Col. John C. Raaen, Jr.

Assignment of Lt. Col. Leslie G. Callahan, Jr., as the first director of the Avionics Laboratory has been announced by Army Electronics Command, Fort Monmouth, N.J.

DEPARTMENT OF THE NAVY

RAdm. John J. Hyland has been assigned as Commander of the U.S. Seventh Fleet in the Far East. The new Seventh Fleet Commander, who will be promoted to the rank of vice admiral, previously served as Director of the Strategic Plans Div., Office of the Chief of Naval Operations, Washington, D.C.

RAdm Allan F. Fleming has been selected as Assistant Director of the Strategic Plans Div., Office of the Chief of Naval Operations. He was Commander Carrier Division Four prior to his new assignment.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. Osmand J. Ritland, Deputy Commander, Manned Space Flight, Air Force Systems Command, Andrews AFB, Washington, D.C., has retired from the Air Force.

Maj. Gen. Harold E. Humfeld has been reassigned as Commander of the Strategic Aerospace Div., SAC, Vandenberg AFB, Calif.

Brig. Gen. Thomas H. Crouch, has relieved Maj. Gen. Theodore C. Bedwell, Jr., as Commander, Aerospace Medical Div., Air Force Systems Command, Brooks AFB, Tex.

Tung-Sheng Liu has been named Systems Engineering Director of the C–5A Systems Program Office.

Col. Currie S. Downie has been assigned as Director of Research Programs, Office of Aerospace Research.

Col. Richard E. Potter is the new Director of Command, Control and Communications, Headquarters, U.S. Air Force.

The Air Force System's Command's new liaison office in Saigon will be headed by Col. John V. Patterson. The new office was established by the command's Aeronautical Systems Div.

Col. Bert M. Smiley has succeeded Brig. Gen. William R. Yancey as Deputy for Reconnaissance at the Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

Small Business Firm Wins Heater Contract

Small business concern managers, who sometimes feel that competing for Government contracts is solely for large industry, should take heart from the example being set by Keysor of Byron, Inc., a small business located in Rockford, Ill.

The company was successful in winning a $1,689,270 multi-year (3 years) Army contract to produce 16,500 −25° F. heater kits for use in the Army's M151 ¼-ton trucks.

The contract, which was set aside for small business concerns, was awarded to Keysor of Byron as a result of competitive bidding.

It was the first time that a two-step, formally advertised, high dollar volume, major secondary item was ever awarded by the Army on a multi-year basis.

Delivery of the heater kits will conclude in May 1968.

The contract was awarded by the Office of the Project Manager for General Purpose Vehicles, Army Mobility Command, Warren, Mich.

Sparrow Missile Tests Conducted by USN-USAF

A joint Air Force-Navy project is under way at the Air Force Missile Development Center, Holloman AFB, N.M., to assess the performance of the Sparrow missile when used with an Air Force F–4C or a Navy F–4B.

The F–4C is the McDonnell-built multipurpose two-man fighter aircraft able to fly at Mach 2 speeds and better. The F–4B is the Navy version of this aircraft.

The AIM–7D air interceptor missile Sparrow is a single-stage solid-fuel air-to-air missile. It has a slim 12-foot long by eight-inch-diameter shape, and a wingspan of 40 inches.

Other flight tests in the overall joint program are being conducted at the Navy's Point Mugu station in California and at Eglin AFB, Fla. Tests are being conducted at varying altitudes and speeds to investigate different flight or compatibility problems.

CALENDAR OF EVENTS

Feb. 10–11: Armed Forces Communications & Electronics Assn. Symposium, Sheraton-Park Hotel, Washington, D. C.

Feb. 13–16: Radiation Research Society Meeting, Coronado, Calif.

Feb. 17–19: Institute of Management Sciences Meeting, Dallas, Tex.

Feb. 28–March 2: 8th Joint National Security Industrial Assn. Industry-Military-Government Packaging & Materials Handling Symposium, Washington, D. C.

March 3–4: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Boston, Mass.

March 9–10: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Atlanta, Ga.

March 16–17: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, St. Louis, Mo.

March 21–24: Institute of Electrical & Electronic Engineers Exposition, New York City.

March 22–31: American Chemical Society Meeting, Pittsburgh, Pa.

March 23–26: Air Force Assn. Convention, Dallas, Tex.

March 27–April 2: American Society of Photogrammetry Meeting, Washington, D. C.

April 5–6: Armed Forces Communications Electronics Assn.-U. S. Army Electronics Command Symposium, Fort Monmouth, N. J.

April 11–15: Institute of Environmental Sciences Meeting, San Diego.

April 12–13: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, San Franciso, Calif.

April 18–21: Aerospace Medical Assn. Meeting, Las Vegas, Nev.

April 18–22: American Geophysical Union Meeting, Washington, D. C.

April 18–22: American Society of Tool and Manufacturing Engineers Meeting, San Francisco, Calif.

April 24–28: American Society of Mechanical Engineers Meeting, Kansas City, Mo.

April 27–28: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Washington, D. C.

Navy Bureau of Yards & Docks Manages DOD Construction in S.E. Asia

As construction agent in Southeast Asia for the Department of Defense, the Navy's Bureau of Yards and Docks has been responsible for the completion of more than $150 million in military construction in South Vietnam and, on completion of [illegible] tional air facility, chiefly for helicopters, has been constructed at Da Nang East which is separated from the main air base by the Tourane River. Called Marble Mountain Air Facility, it has a 2,000-foot pierced steel plank runway and a 195,000 [illegible]

GSA Authorizes Sale of Security Cabinets to Canada

Canada's Department of Defence has been given permission by the General Services Administration's U.S. Federal Supply Service to purchase approved Class III non-insulated security filing cabinets for use within the Dominion of Canada. The request for this authorization came from the Director of Industrial Security, Department of Defence Production, Government of Canada, Ottawa, Canada.

Canadian contractors, including Canadian governmental agencies, may be authorized by Federal agencies to utilize our Federal Supply Schedules pursuant to the provisions of Subpart 1–5.9, Federal Procurement Regulations, and Section 101–26.407, Federal Property Management Regulations.

In addition, the Federal Supply Service will permit its Federal Supply Schedule contractors to sell equipment directly to the Canadian government or any contractor authorized by the Canadian government to purchase such equipment. The grant of such permission will accommodate the government of Canada in cases in which it or its contractors are not eligible to procure cabinets under the terms of the above cited regulations.

This is GEEIA

by

Brig. Gen. Stephen D. McElroy, USAF

The new North American Air Defense Command Operations Center in Cheyenne Mountain near Colorado Springs, Colo., became operational on January 1 of this year. This command and control complex is deep within the heart of the legendary 9,200-foot peak towering more than half a mile over Colorado Springs and is fast becoming honeycombed with a network of passages filled with three story buildings. Inside are communications facilities engineered and installed by the Air Force Logistics Command's Ground Electronics Engineering Installation Agency (GEEIA).

The Cheyenne Mountain job is only one of the many simultaneous engineering, installation and maintenance tasks carried out by GEEIA. But this wasn't always the case.

Prior to 1958 there were 24 Air Force activities in some seven commands engaged in the business of engineering and installing ground Communications-Electronics (C-E) facilities. Thus, there existed cumbersome coordination channels, competition for limited resources, a dissipation of resources and a non-standardization of end products. All this contributed to a very delinquent Air Force ground C-E program.

Out of these circumstances, GEEIA was born on June 16, 1958. This centralized the vast majority of the Air Force ground C-E engineering and installation requirements under one command, the Air Force Logistics Command (AFLC).

GEEIA started with the small cadre of eight officers, one airman and 20 civilians at Griffiss AFB, N.Y., as part of the Rome Air Materiel Area (ROAMA). Today, GEEIA's far flung organizational elements are found in all corners of the free world. Personnel are working in 45 states and 29 foreign countries, from Cape Kennedy to Saigon and Athens to Anchorage. GEEIA troops can be found at more than 400 different locations on any given day.

In 1964, the mobile depot activity units, which performed on-site depot level maintenance on ground C-E gear, were assigned to and merged into the GEEIA organization.

AFLC announced on Jan. 1, 1965, that GEEIA was no longer a part of ROAMA and was to report directly to Headquarters, AFLC. GEEIA's mission is covered by AFLC Regulation 23-17. It encompasses these responsibilities:

- Develop and publish technical standards.
- Provide technical assistance directly to Air Force commands in developing C-E requirements in what is known as a C-E Implementation Plan or CEIP.
- Prepare base wire and telephone development schedules.
- Engineer, install and provide on-site depot level maintenance on ground C-E facilities.
- Control and manage C-E materiel resources needed to accomplish the installation and depot level maintenance on C-E facilities.
- Accomplish systems implementation testing and acceptance of facilities.
- Accomplish interference radiation and hazard reduction.
- Train and develop a reserve force for wartime or national emergency.
- Participate, as required, in the Military Assistance Program (MAP).
- Provide on-site mobile depot level maintenance for ground C-E facilities.

GEEIA prepares the engineering required for installation and then carries out the installation of ground C-E facilities such as communications centers, long range radars, Nav-Aids, command and control systems, to name a few. The customer (the major air commands) initiates the requirement. GEEIA insures that the material is available to do the job, that it arrives on site by the required installation date, that it is completely installed, tested and then turned over to the customer.

However, GEEIA's concern does not end here. It continues with the responsibility for on-site depot level maintenance and the modification of the equipment which it installed. Additionally, when the equipment becomes obsolete and is no longer required, GEEIA knocks it down. Thus, its job in the C-E business is more than a "cradle-grave" operation. It is a "conception to the grave" responsibility.

GEEIA has 427 officers, 4,200 airmen, 3,000 civilians, including 1,400 civil service, 1,100 wage board and 300 foreign nationals. Under a USAF-directed program it is converting its 758 Contract Technical Services personnel to civil service and military members.

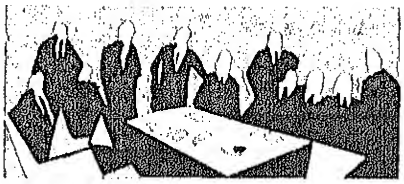
This force is further backed by a first-line, fully-qualified installation-maintenance capability present in the Air National Guard (ANG).

Approximately 3,000 highly skilled troops in 17 ANG squadrons are located in the United States. These ANG officers and airmen, with approximately 17 to 20 years experience each in the C-E installations business working for Bell Telephone, local power companies, etc., represent a valuable capability as a C-E recovery force in the event of national emergency or disaster. In their training periods, these ANG troops are accomplishing useful and valuable work for the Air Force. GEEIA workloaded these squadrons last year with more than 150,000 manhours.

At the work sites, the job is in the hands of an installation team. This team will range in size from two to 15 airmen. The team chief is usually a noncommissioned officer. In some cases it has been necessary to place the responsibility in the hands of an airman first class.

Since GEEIA has a bigger workload than its organic capability, it must go to contract for some of its workload. For example, in the past year GEEIA took on 4,500 jobs—3,500 by GEEIA troops and 1,000 by contract. Some of the recent accomplishments of these men have created high level interest and borne such names as Star Sapphire, Back Porch, Wind Drift and the previously mentioned Cheyenne Mountain complex.

As a means of improving emergency support to command customers, GEEIA developed project TRUST (transportable units and self-sufficient teams). This is a GEEIA plan to fulfill that part of GEEIA's mis-



MEETINGS AND SYMPOSIA

FEBRUARY 1966

Syposium on Radioisotope Applications in Aerospace, Feb. 15–17 (corrected date), at Biltmore Hotel, Dayton, Ohio, and Wright Patterson AFB, Ohio. Co-sponsors: Air Force Flight Dynamics Laboratory and Atomic Energy Commission (Radiation Applications Branch, Isotopes Development Div.). Contact: Dr. Paul Polishuk, Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio, 45433.

Interdisciplinary Aspects of Radioactive Energy Transfer, Feb. 24–26, at the Sheraton Hotel, Philadelphia, Pa. Sponsor: Office of Naval Research. Contact: Morton Cooper, Office of Naval Research (Code 438), Department of the Navy, Washington, D.C. 20360, (Area Code 202) OXford 6-6839.

MARCH 1966

National Conference on Space Maintenance and Extra Vehicular Activities, March 1–3, at the Meyer Motor Inn, Orlando, Fla. Co-sponsors: Air Force Aero Propulsion Laboratory and Martin Co. Contact: Mr. E. May (APFT), Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio 45433, (Area Code 513) 253-7111, ext. 2-7107.

Symposium on the Coupling of Basic and Applied Corrosion Research, March 21–22, at the National Bureau of Standards, Washington, D.C., and Gaithersburg, Md. Co-sponsors: Office of Naval Research Laboratory and National Bureau of Standards. Contact: Dr. Richard C. Carlston, Office of Naval Research, Department of the Navy, Washington, D.C. 20360, (Area Code 202) OXford 6-1801.

Conference on Functional Analysis, March 28-April 1, at the University of California, Irvine, Calif. Co-sponsors: Air Force Office of Scientific Research and the University of California. Contact: R. G. Pohrer (SRMM), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D.C. 20333, (Area Code 202) OXford 6-5248.

Second International Symposium on Aerobiology, March 29–30, at Chicago, Ill. Co-sponsors: U.S. Army and Illinois Institute of Technology Research Institute. Contact: Elwood K. Wolfe, Director of Technical Services, Fort Detrick, Frederick, Md., (Area Code 301) 663-4111, ext. 2214.

Low Speed Aerodynamic Problems Associated with Helicopters and V/STOL Aircraft, March 30-April 1, at Buffalo, N.Y. Co-sponsors: U.S. Army Aviation Materiel Laboratories and the Cornell Aeronautical Laboratory. Contact: John E. Yeates, Chief, Aeromechanics Div., Army Aviation Materiel Laboratories, Fort Eustis, Va. 23604, (Area Code 703) 878-4101.

APRIL 1966

Second Symposium on Marine Bio-Acoustics, April 6–8, at American Museum of Natural History, Central Park West at 79th St., New York City and Naval Training Device Center, Port Washington, N.Y. Sponsor: Naval Training Device Center. Contact: F. E. Wolf, Jr., Research Program Manager, Naval Training Device Center, Port Washington, N.Y. 11050, (Area Code 516) PO 7-9100, ext. 550.

Conference on Ground-Based Aeronomic Studies of the Lower Ionosphere, April 11–15, at the Defense Research Telecommunications Establishment (DRTE), Ottawa, Canada. Co-sponsors: Air Force Cambridge Research Laboratories and DRTE. Contact: W. Pfister (CRUB), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01731, (Area Code 617) CR 4-6100, ext 3019.

Symposium on Generalized Networks, 16th in a series of international symposia organized by the Polytechnic Institute of Brooklyn, Microwave Research Institute, April 12–14, at New York City. Sponsors: Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, Society for Industrial and Applied Mathematics and the Institute for Electrical and Electronics Engineers. Contact: Lt. Col. E. P. Gaines, Jr., (SREE), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D.C., (Area Code 202) OXford 6-3671.

Twentieth Annual Frequency Control Symposium, April 19–21, at the Shelburne Hotel, Atlantic City, N.J. Sponsor: Army Electronics Laboratories. Contact: M. F. Timm, Solid State & Frequency Control Div., Army Electronics Laboratories, Fort Monmouth, N.J., (Area Code 201) 5-1728.

Mathematical Aspects of Computer Science, dates undetermined, at New York City. Sponsors: Air Force Office of Scientific Research, Army Research Office-Durham, Institute for Defense Analyses, Association for Computing Machinery, Association for Symbolic Logic and the American Mathematical Society. Contact: Capt. J. Jones, (SRMA), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D.C. 20333, (Area Code 202) OXford 6-1302.

MAY 1966

Symposium on Electrode Processes, May 1–6, at Cleveland, Ohio. Co-sponsors: Air Force Office of Scientific Research and the Electrochemical Society, Inc., Contact: Lt. Col. M. Sprinkel (SRC), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W. Washington, D.C. 20333, (Area Code 202) OXford 6-8706.

Bionics Symposium 1966, May 3–5, at the Sheraton Hotel, Dayton, Ohio (rescheduled from March 1966) Co-sponsors: Aerospace Medical Research Laboratory, Aerospace Medical Div. and Avionics Laboratory, Air Force Research and Technology Div. Contact: Dr. H. L. Oestreicher (MRBAM), Aerospace Medical Research Laboratory, Wright Patterson AFB, Ohio, (Area Code 513) 253-7111, ext. 3-6108.

Ninth Navy Science Symposium, May 5–6, at Departmental Auditorium, Constitution Ave., between 12th and 14th Streets, N.W., Washington, D.C. Sponsor: Office of Naval Research. Contact: Robert J. Mindak, Conference Chairman, Office of Naval Research, Department of the Navy, Washington, D.C. 20360, (Area Code 202) OXford 6-4720.

SPRING 1966

Second International Symposium on Airborne Infection, dates undetermined, at Baltimore, Md. Co-sponsors: Department of the Army and the Johns Hopkins School of Medicine. Contact: Elwood K. Wolfe, Director of Technical Services, Fort Detrick, Frederick, Md., (Area Code 301) 663-4111, ext. 2214. (Rescheduled from Oct. 20–21, 1965).

Around the Horn from MIL-D-5028 to MIL-D-1000

by
Jack L. Flippo
Chief, Contractor Data Management Office
Headquarters, Air Force Logistics Command

Over a period of many years, the preparation and acquisition philosophy of engineering documentation by the Defense Department has been undergoing an evolutionary change. To some this evolution appears revolutionary. We could evaluate this change as "going around the horn" or, in the military vernacular, doing a "one-eighty" degree turn.

Historically, engineering documentation has been prepared in support of research and development, production, manufacturing and testing. Its main purpose has been to provide a means of translating information from the engineering arm to the drawing board in such a manner that it could be used by either the manufacturing or procuring activities, as appropriate. Perhaps a better way of expressing it would be to say, "engineers do not design drawings"—they design things; the drawings then become the pictorial delineation of those things.

The Air Force, for many years, has been using a variety of specifications to advise contractors how to prepare their engineering drawings in support of the items that the military buys. This is especially true when the military is paying for the design of purely military hardware.

Let us begin with the year 1953, when the first of these specifications, MIL-D-5028 (ASG), was issued. The "A" revision was issued in 1954 and the "B" revision in 1956. MIL-D-5028 was a dynamic document which underwent numerous changes during a relatively unchanging time when viewed in terms of the present day situation. The scope of the specification covered "the preparation of manufacturers' engineering design drawings, as defined in Section 6, and related data lists for the production of aeronautical and associated equipment." Paragraph 6.1 of the specification, titled "Intended Use," stated, "Drawings and data lists covered by this specification are for engineering evaluation of the articles, identification of stock, ordering and storing replacement parts, inspection of articles at overhaul, and general maintenance of equipment in service."

In no instance did the specification specifically state or imply that the data was to be used for competitive reprocurement. In those days it was always assumed by contractors that the drawings were being furnished to the Government for support of the intended uses, unless otherwise specified in the contract.

In 1957, the Air Force, in order to improve its competitive position, developed MIL-D-26085, initiating the Air Force Control Drawing Program commonly referred to as the AFCON Drawing Program. The AFCON Drawing Program cited MIL-D-5028 as an applicable document, but it substantially expanded the intended use to include procurement by incorporating such statements as "are intended to be used as a portion of the reprocurement data." The whole idea of the AFCON Drawing Program was not only to obtain engineering data suitable for engineering evaluation, but to assure that it was suitable for use by any manufacturer who would normally produce such items.

Before the Air Force was actually able to gain experience and prove or disprove the worth of the AFCON Drawing Program, MIL-D-70327 was released. This specification was heralded by both industry and DOD as the ultimate in standardization covering drawing preparation by the Department and its contractors.

Paragraph 6.1 includes two concepts in particular which had not been a part of previous specifications. First, the data acquired by the Government was "subject to rights-in-data acquired under the contract." This action now tied the acquisition of the data to the Armed Services Procurement Regulation, Section IX, Part 2, hereafter referred to as ASPR. Secondly, it expanded the intended use to specifically state that the specification may be used by DOD activities for *procurement, production* and *manufacturing*, as well as some 15 other intended uses. It also included the statement, "and wherever engineering drawings are needed."

At about this time, the now famous Secretary Pike memorandum, directing the Military Departments to increase or rather optimize competitive procurement, was issued. This memorandum had the effect of directing the Military Departments to initiate action to assure optimum competitive procurements. Upon release of MIL-D-70327, the revised ASPR policy, and the DOD stated policy "that the Military Services will optimize competitive procurement," the Air Force went all out to achieve the DOD objective of maximizing competitive procurements. This was evident by ordering drawings under the specification with the *intended use* of using them for manufacturing via the competitive procurement process.

Shortly after the release of MIL-D-70327, the Air Force suspended any further implementation of the AFCON Drawing Program. This action was directed by DOD on the assumption that MIL-D-70327 provided the necessary tools to order engineering documentation in support of the competitive procurement processes.

While the engineering drawing program was going through the MIL-D-70327 evolutionary stage, a similar effort was undertaken to rewrite ASPR. The revised ASPR provided a broad definition of data and introduced the term "proprietary rights." The new version defined the conditions and limitation under which R&D contractors would be required to furnish data under research and development.

MIL-D-70327 was excessively restrictive and that grades of documentation, based on the need, could be produced at lower costs. Other industry associations and companies complained of the specification Christmas tree.

While all this was going on, other contractors were complaining about the Government usurping their proprietary rights. The subject of proprietary rights became one of the leading issues of the day between the military and industry. It should be brought out here that it was not providing engineering drawings to the Government, but rather the legal right to disclose the data as an example in reprocurement packages, that was at issue.

The Air Force exercised great care and enthusiasm in attempting to improve its competitive position in the industrial community. To cite a few of the programs to improve competition, the Air Force required contractors to provide information concerning methods of procurement and, where feasible, to provide procurement data packages. It initiated a comprehensive program to review drawings on hand to determine their usability for competitive procurement.

Industry reacted strongly to these Air Force efforts to increase competitive procurement. Industry opposition became evident almost immediately. Contractors began removing so-called proprietary information from drawings, would not sign contracts which required the delivery of any data and placed prices on data which were tantamount to "not for sale." It was soon apparent that a serious breakdown of engineering data communication between the Air Force and its contractors was imminent.

To eliminate or reduce the problems, the Air Force initiated two major programs. The first was known as the Air Force's "Competition with Confidence" program. This was a program by which the Air Force and its contractors determined, at the time of provisioning (or at some mutually acceptable time during production), those items which were susceptible to competition. The second was the "Deferred Delivery of Engineering Documentation" program designed to leave the engineering documentation, which normally would have been delivered to the Government, with the contractor but making provisions for Air Force activities to order the engineering documentation direct from the contractor engineering data files on an "as required" basis.

At about the same time, the Air Force Contractor Data Management Program, herein referred to as the 310-1 program, was born. Under the 310-1 program discrete items of data were developed against specific missions to be supported by the drawings. Under the old program, MIL-D-5028, it was the general practice of the Air Force to buy complete sets of engineering documentation. Later, under the MIL-D-70327 program, even though the policy was to be more selective in that only that data which was specifically required need be ordered, the military continued to request a complete set of engineering data.

While the Air Force was in the process of implementing the new Contractor Data Management Program under the joint Air Force Systems Command/Air Force Logistics Command Manual 310-1, DOD, as a result of the concerted efforts of industry, undertook two major projects. The first of these projects was the rewrite of ASPR to remove the proprietary rights problems. The other project was the revision of MIL-D-70327 to provide: (1) simplified drawing practices which would incorporate the absolute minimum preparation instructions; (2) a standard requirements document which could be incorporated in the specification, thereby eliminating such documents as the Navy WR-12 and the Air Force MCP 71-77; and (3) a quality control or acceptance method to validate that the ordering activity was, in fact, getting what it ordered and to assure it got that for which it paid. These two projects culminated in the release of ASPR and the release of MIL-D-1000, dated March 1, 1965, with a supporting MIL-STD-100, same date.

MIL-D-1000 will provide the Government a new basis of negotiating with contractors and also more flexibility between the Government and industry in ordering engineering data. It will permit the Government to order (1) data for a specific intended use and (2) drawings which do not fully comply to the requirements of MIL-STD-100 and other standards specified in MIL-D-1000. It will minimize the requirements to prepare drawings to exacting specifications and hopefully will provide drawings to intended use, as opposed to the previous practices of ordering a complete set drawn to exacting standards called for by MIL-D-70327.

MIL-D-1000 is a real step forward. However, a few words of caution are in order. First, there appears to be a false assumption inherent in the drawings preparation specification under intended use. MIL-D-1000 may cost the Government more money because when ordering drawings the Government specifies one or more of the 10 categories. Contractors will now need to review their drawings to determine whether or not they are suitable for the intended use specified. As previously stated, contractors prepare their drawings in support of their design and productions, not in support of the military follow-on logistic missions after production. A few examples are provided for explanatory purposes:

- Under Category D contractors must furnish on their drawings "details of performance characteristics, and quality levels and test requirements when necessary to differentiate between similar items." Is this type of information normally contained on production drawings?
- Under Category G—Installation—drawings must contain "auxiliary equipment and facility requirements; safety precautions; and human engineering considerations." Most people will agree that these types of things are rarely contained on drawings, but are normally contained in other documentation maintained by the contractors.
- Under Category E—Procurement (identical items)—drawings "shall include, as applicable, but shall not necessarily be limited to: details of unique processes essential to design and manufacture; details of performance ratings; evaluation requirements and criteria." Is this information normally contained on the drawing? If not, additional costs will be incurred in making it a part of the drawing package in support of advertised procurement by the Government.

The next area of caution concerns the requirement to specify (paragraph 3.1, MIL-D-1000) at time of contract award both category and form for each item. The technique for implementing this requirement appears as a real problem area when viewed in terms of how to specify category and form for each item of supply at the time of contract award. This occurs at a time when you don't know what the item is, how the item will be reproduced, how the item will be re-manufactured, etc., and, in the case of vendor items, who is the vendor and who are his subvendors.

Another consideration which will take time to smoke out will be the real impact of the new "private expense" philosophy expressed in the new ASPR. Naturally this will have a strong bearing on the effectiveness and ability of the Government to procure adequate data in support of the Government reprocurement programs and logistic support.

Thus, we have been "around the horn." Changes have been made in the entire DOD acquisition philosophy for engineering data. This philosophy has gone from one of saying, "Please give me a complete set of engineering data for intended uses, as cited in MIL-D-5028," to one of saying, "Give me only that portion of your engineering data files required to support specific missions plus either furnish or prepare additional data to meet the intended use categories when specified in the contract."

Hopefully, the latter approach will provide data vital to logistic support once the military has acquired operational quantities of weapons systems and the contractor has ceased to maintain a design and production capability.

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MARCH 1966

SPEAKERS CALENDAR

OFFICE OF THE SECRETARY OF DEFENSE

Dr. Thomas P. Cheatham, Jr., Dep. Dir. (Tactical Warfare Programs) Office of Dir., Defense Research & Engineering, at Assn. of the U. S. Army Target Acquisition & Surveillance Symposium, Ft. Huachuca, Ariz., Jan. 25.

Hon. John S. Foster, Jr., Dir., Defense Research & Engineering, at Institute of Electrical & Electronics Engineers 1966 Winter Convention on Aerospace & Electronic Systems, Los Angeles, Calif., Feb. 3.

Mr. William B. Petty, Dir., Defense Contract Audit Agency, at National Contract Management Assn. Meeting, Philadelphia, Pa., Feb. 8; at Southeastern Government Procurement Symposium of the National Contract Management Assn., Orlando, Fla., March 3 or 4.

Mr. Daniel J. Fink, Dep. Dir. (Strategic & Space Systems), Office of Dir., Defense Research & Engineering, at American Astronautical Society Meeting, Washington, D.C., March 16.

Lt. Gen. William J. Ely, USA, Dep. Dir. (Administration & Management), Office of Dir., Defense Research & Engineering, at Industrial College of the Armed Forces, Washington, D. C., April 7.

DEPARTMENT OF THE ARMY

Lt. Gen. William F. Cassidy, Chief of Engineers, at the Society of American Military Engineers Meeting, The Citadel, Charleston, S. C., Feb. 9.

Maj. Gen. David P. Gibbs, Chief of Communications Electronics, at Armed Forces Communications Electronics Assn. Meeting, Ft. Monmouth, N. J., April 4–6.

DEPARTMENT OF THE NAVY

VAdm. I. J. Galantin, Chief of Naval Material, at Navy League Meeting, Los Angeles, Calif., Jan. 28.

Capt. Walter F. Mazzone, Officer-in-Charge, Navy Medical Research Laboratory, Groton, Conn., at Annual Dinner of Central Illinois Chapter of the Society of Professional Engineers, Decatur, Ill., Feb. 22.

DEPARTMENT OF THE AIR FORCE

Hon. Harold Brown, Secretary of the Air Force at Air Force Assn. Convention, Dallas, Tex., March 24–25.

Gen. J. P. McConnell, Chief of Staff, at Air Force Assn. Convention, Dallas, Tex., March 24–25; at Arnold Air Society National Conclave, Dallas, Tex., April 6; at The Citadel, Charleston, S. C., April 16.

Gen B. A. Schriever, Commander, Air Force Systems Command, at Achievement Rewards for College Scientists Annual Science Ball, Los Angeles, Calif., April 2; at American Institute of Aeronautics & Astronautics and American Society of Mechanical Engineers Meeting, Cocoa Beach, Fla., April 19.

DCASR Activation Completed

Defense Contract Administration Services Regions (DCASR's) were activated at Los Angeles and San Francisco on Dec. 1, thereby completing a nationwide network of personnel performing contract administration services for the Army, Navy, Air Force and the Defense Supply Agency.

The first of a total of 11 DCASR's was established at Philadelphia in August 1964. Detroit was activated in April 1965 followed by Dallas, Boston, Cleveland, Atlanta, Chicago, St. Louis and New York.

The 11 DCASR's administer Defense contracts for the military buying agencies nationwide. This work includes pre-contract award surveys of contractors' facilities and financial status, quality assurance, security clearance for plants and personnel, payments to contractors and similar functions required by the Government during the manufacture and maintenance of defense materiel.

Following is a list of the 11 Defense Contract Administration Services Regions including addresses and telephone numbers:

DCASR, Atlanta
3100 Maple Drive NE
Atlanta, Ga. 30305
(Area Code 404) 261–7310

DCASR, Boston
666 Summer St.
Boston, Mass. 02210
(Area Code 617) 542–6000

DCASR, Chicago
O'Hare International Airport
P.O. Box 8758
Chicago, Ill. 60666
(Area Code 312) 296–4411

DCASR, Cleveland
1367 East Sixth St.
Cleveland, Ohio 44114
(Area Code 216) TO 1–4960

DCASR, Dallas
500 South Ervay Street
Dallas, Tex. 75201
(Area Code 214) RI 9–2371

DCASR, Detroit
1580 East Grand Blvd.
Detroit, Mich. 48211
(Area Code 313) 923–0100

DCASR, Los Angeles
11099 La Cienega Blvd.
Los Angeles, Calif. 90045
(Area Code 213) SY 6–0471

DCASR, New York
770 Broadway
New York, N.Y. 10003
(Area Code 212) OR 7–3030

DCASR, Philadelphia
2800 South 20th St.
Philadelphia, Pa. 19101
(Area Code 215) 271–2000

DCASR, St. Louis
4300 Goodfellow Blvd.
St. Louis, Mo. 63120
(Area Code 314) EV 2–8200

DCASR, San Francisco
866 Malcolm Road
Burlingame, Calif. 94010
(Area Code 415) 692–0300

Military Construction Deferred

Secretary of Defense Robert S. McNamara has announced that $620,000,000 worth of military construction projects will be temporarily deferred including the building of 8,500 military housing units worth $160,000,000.

At the same time, Secretary McNamara gave the go-ahead for $686,000,000 in Army, Navy, Air Force and Marine Corps high priority military construction projects in 36 states, the District of Columbia and at 16 overseas locations.

Defense Secretary McNamara, in making the announcement, emphasized that all projects immediately essential for the combat support of the armed forces and those urgently required for safety, health, or other compelling reasons will proceed as scheduled.

The decision to defer projects located in 42 states, the District of Columbia and 16 sites outside the United States results from a new review of DOD expenditures focused on immediate requirements in direct support of combat forces in Vietnam.

The construction projects to be delayed for the most part are either long-planned replacements or improvements for existing facilities. The deferred projects, although necessary and desirable, can be undertaken at a later date without impairing military operations or effectiveness.

Defense Speakers Announced for DOD-NSIA Advanced Planning Briefings

The following Defense Department speakers at the 1966 DOD-National Security Industrial Association Advanced Planning Briefings for Industry have been announced by Deputy Secretary of Defense Cyrus Vance. At press time, speakers representing industry and labor organizations had not been announced. Names of these speakers will be carried in the February issue.

FIRST DAY

DOD Keynote Address: Major objectives of the DOD and the program designed to implement them. The changing patterns in Defense spending and the resulting problems and opportunities.

Speakers:

Hon. Paul R. Ignatius, Asst. Secretary of Defense (Installations & Logistics), at Boston, March 3; at Washington, D.C., April 27.

Hon. Robert N. Anthony, Asst. Secretary of Defense (Comptroller), at Atlanta, March 9.

Hon. Alain Enthoven, Asst. Secretary of Defense (Systems Analysis), at St. Louis, March 16.

Hon. John S. Foster, Jr., Dir., Defense Research & Engineering, at San Francisco, April 12.

The Technological Challenge of the Next 10 Years: Future opportunities for industry in all areas of defense research and development.

Speakers:

Daniel J. Fink, Dep. Dir. for Strategic & Space Systems (Defense Research & Engineering), at Boston, March 3.

Lt. Gen. William J. Ely, Dep. Dir. for Administration & Management (Defense Research & Engineering), at Atlanta, March 9.

Dr. Thomas P. Cheatham, Jr., Dep. Dir. for Tactical Warfare Programs (Defense Research & Engineering), at St. Louis, March 16.

Dr. Chalmers W. Sherwin, Dep. Dir. for Research & Technology (Defense Research & Engineering), at San Francisco, April 12.

Thomas F. Rogers, Dep. Dir. for Electronics & Information Systems (Defense Research & Engineering) at Washington, D.C., April 27.

Systems Analysis and Cost Effectiveness: A discussion of the extensive use of systems analysis techniques within DOD to assist in the efficient allocation of Defense resources and the reasons why these techniques have been introduced. An exploration of the implication of this development for Defense industry.

Speakers:

Russell Murray II, Dep. Asst. Secretary of Defense for General Purpose Programs (System Analysis), at Boston, March 3; at Atlanta, March 9.

Dr. Victor K. Heyman, Asst. for Special Projects (Systems Analysis), at St. Louis, March 16.

Hon. Alain Enthoven, Asst. Secretary of Defense (Systems Analysis), at San Francisco, April 12.

Fred S. Hoffman, Dep. Asst. Secretary of Defense for Strategic Programs (Systems Analysis), at Washington, D. C., April 27.

Resource Management Systems: DOD efforts to obtain integration and coordination among the multiple Defense management programs with emphasis on management of major capital acquisitions—Selected Acquisitions Information and Management System (SAIMS)—and the participation therein of Defense contractors. Current activity and future planning in the components of SAIMS to include Cost Information Reports (formerly CEIS) and Contract Performance Measurement.

Speaker:

George W. Bergquist, Special Asst. for Asset Management Systems (Comptroller), at all five cities.

Management Trends in Defense Research & Development: ODDR&E efforts to clarify R&D management concepts and intent including both clarification and integration of all management policies affecting the conduct and desired operating environment of R&D; emphasis on integration of direct R&D policies with related policies such as System/Project Management, Configuration management, Total Package Procurement and Contract Definition.

Speaker:

James W. Roach, Asst. Dir. for Engineering Management (Defense Research & Engineering), at all five cities.

Procurement Management Trends: Contracting trends, with emphasis on the impact of new or revised management techniques planned or under development such as Contractor's Weighted Average Share in Risk (CWAS), Total Package Concept, Life Cycle Costing, extension of Contractor Performance Evaluation and profit opportunities under the new Value Engineering clauses; the Small Business and Contractor Cost Reduction Programs; Defense industry profits.

Speaker: John M. Malloy, Dep. Asst. Secretary for Procurement (Installations & Logistics), at all five cities.

Defense Supply Agency — Procurement Trends and Future Industry Relationships: The functions of the Defense Supply Agency, its purchasing and contracting objectives and the markets it offers for business and industry.

Speaker: VAdm. Joseph ... Supp... USN, Dir., Defense Supply Agency, at all five cities.

SECOND DAY

Army Advanced Planning ... ments: The Army's ... research and development ... ments based on the ... move, shoot, communicate ... the present and future ... ties for business to ... hardware and research and ... ment in these areas.

Speakers: (At all five cities)

Hon. Robert A. Brooks, A... retary of the Army (Inst... & Logistics).

Gen. Frank S. Besson, J... CG, Army Materiel Com...

Maj. Gen. John G. Zierd... CG, Army Missile Comm... stone Arsenal, Ala.

Maj. Gen. William W. ... USA, CG, Army Mobili... mand, Warren, Mich.

Maj. Gen. Roland B. A... USA, CG, Army Weapo... mand, Rock Island, Ill.

Maj. Gen. Floyd A. Hans... CG, Army Munitions C... Dover, N.J.

Brig. Gen. William B. Lat... CG, Army Electronics C... Fort Monmouth, N.J.

Navy Advanced Planning ... ments: A forward look ... and Marine Corps research ... opment and procurement; ... cast of material requirem... support of the Navy and ... Corps, and a review of opp... for business to provide ... onry and warfare systems ... and Marine Corps will ... the future.

Speakers:

Hon. Robert W. Morse, As... tary of Navy (Research ... opment) at Boston and A...

Hon. Graeme C. Bannerman ... Secretary of Navy (Instal... Logistics), at St. Louis, S... cisco, and Washington, D...

(At all five cities)

VAdm. I. J. Galatin USN, ... Navy Material.

RAdm. A. M. Shinn USN, ... Bureau of Naval Weapons

RAdm. Edward J. Fahy US... of the Bureau of Ships.

Brig. Gen. Wood B. Kyle ... Headquarters, U.S. Marine ...

Air Force Advanced Planning ... quirements: The role and ... nities for business and in... the Air Force-industry ... broad look at present and f... requirements of the Air ... research, development and ... support with emphasis on ... and technology plans and ... lation of operational req... into development plannin... term research, developm... logistics support procurem...

(Continued on Page 2...

FROM THE SPEAKERS ROSTRUM

Ronald M. Murray

Address by Ronald M. Murray, Assistant Director (International Programs), Office of the Director of Defense Research and Engineering at American Institute of Aeronautics and Astronautics, Royal Aeronautical Society, and Japanese Society for Aeronautical and Space Sciences Aircraft, Design and Technology Meeting, Los Angeles, Calif., Nov. 17, 1965.

International Cooperation in the Development of Military Aircraft

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The Reason for Cooperation.

I would like to begin by asking a question which our foreign friends sometimes ask us. It goes like this: "Since the United States military R&D budget is much larger than that of any of its allies, why are you interested in cooperating with us in R&D? What's in it for you?" A formal answer would quote from the Department of Defense directive (DOD Directive 3100.3) which in September 1963 spelled out our objectives for international cooperation to be as follows:

"The U.S. will cooperate with its allies to the greatest degree possible in the development of defense equipment, where such cooperation is in the overall best interests of the United States. The objectives of such cooperation will be:

"1. To make the best equipment available to the U.S. and its allies in the most timely manner.

"2. To increase the effectiveness of the scientific and technical resources of the U.S. and its allies, especially by eliminating unnecessary and wasteful duplicating of effort.

"3. To achieve the maximum practicable degree of standardization of equipment.

"4. To create closer military ties among the alliance."

I believe these reasons for cooperation are indisputable, important and general. To be more specific, in your own field of military aircraft, I would like to offer you two reasons for cooperation which are more closely related to your everyday work technology and money.

What do we mean by technology? While indeed the American aircraft industry has much to be proud of in its technology and its accomplishments, it certainly must acknowledge the very excellent technical work done in other countries in recent years, resulting often in advances in fields in which we have been working and, sometimes, in fields which we ourselves have not been pursuing as hard as they. There are many paths to success, and breadth of approach is an important parameter before a final decision and selection is made.

Consider the field of V/STOL, which is one of those in which we are most active in cooperation with our allies. Look at some of the unique developments of the other countries. For example, we have in Great Britain the vectored thrust P–1127 V/STOL fighter; in France, the high-performance Mirage III–V, using a combination of lift and cruise engines; in Germany, the supersonic VJ–101, with its excellent system of engine thrust modulation for attitude control in the transitional modes. And look at the work which Japan has done in the application of STOL techniques to seaplanes—an area, to my knowledge, not covered by those of us in the Western world.

Obviously, we would have much to gain from cooperation in the V/STOL field and we have much to offer our partners from our own experimental V/STOL programs, as well as from our general base of aircraft technology.

Now as to money. I am sure you all know better than I the great increase in the cost of the development of military aircraft, the resulting strains on the development budgets and, since our budgets do have finite limits, the limitations in the number of aircraft projects we can afford to pursue. For example, consider the cost of developing fighter aircraft. The F–86, which first flew in 1948, cost under $100 million to develop. Its big brother, the F–100, which first flew in 1953, cost around $200 million to develop. Flying two years later, the F–105 cost about $400 million to develop. And now, first flying in 1964, the F–111 will cost about double the F–105 to develop. So there has been an increase in development cost from the F–86 to the F–111 of nearly an order of magnitude. Obviously, it is essential for each of us, regardless of how large our R&D budgets are, to economize as much as we can in development costs, and obviously one logical way of doing this is to share the load with other people who have similar interests and similar competence in the field. The whole is greater than the sum of its parts, if we cooperate—and the free world must do this if we are to stay free.

The Ways of Cooperation.

Now that you are convinced that cooperation in the development of military aircraft is highly desirable, consider the ways in which we in DOD believe that cooperation is practical.

The oldest form of inter-governmental cooperation, beginning intensively in World War II, is the exchange of technical information. This is done in a variety of ways, such as by formal government-to-government data exchange agreements, by exchange visits and by participation in multi-national symposia like the V/STOL symposium sponsored by the Advisory Group for Aerospace Research and Development (AGARD) in NATO last year.

During the last several years, the main aim of DOD has been to work out sharing of development projects, and we have been moderately successful in this. To illustrate, I would like to describe four different projects in the aircraft field that cover pretty well the more likely ways of cooperation.

Starting upstream in the development cycle, we entered into an agreement a year ago with the United Kingdom for cooperative work in the experimental application of beryllium to jet engines. You probably are familiar with the properties of beryllium which make it a highly promising but challenging material for lightweight applications. Cooperating with the British on the application of beryllium was a natural. They had done a lot of work in the refinement of beryllium to very high purities, while U.S. contractors had done much in forging, machining and joining techniques. We each agreed that we

both would be better off by pooling these different capabilities and experience for the experimental application of beryllium to engine components. We agreed to share the costs, the work and the results of nine specific tasks in materials improvement and five tasks in engine applications. There are now a total of 10 U.S. and U.K. contractors and laboratories working on this project, with the promise of very real benefits to all.

Now, let's move downstream one notch to advanced development projects. Some of you are familiar with the joint design studies that the Air Force and the Federal Republic of Germany are having performed on high-performance, advanced V/STOL strike fighter aircraft. There are four U.S. firms and two German firms doing these studies, which will be completed in the spring of 1966. In these, the U.S. contractors are drawing upon their extensive V/STOL studies, such as ADO-12, their various experimental programs and their advanced technology for high-performance aircraft. German contractors are drawing upon their own studies of V/STOL operation in the European theater, their design work on several V/STOL fighters and the flight testing of the VJ-101. And the joint design studies were preceded by joint military studies to define the optimum mission specifications.

The Germans and we expect the joint design studies to give the best possible indication of the capabilities and usefulness of high performance strike V/STOL aircraft for the 1970's. With this information and considering the military and cost aspects, both we and the Federal Republic should be able to make our decisions next year as to whether to go into the development of prototypes. Whatever the outcome, we should both be in a more knowledgeable position to reach our national decisions as a result of having looked at the problems jointly.

Moving now from joint design studies to joint development projects, we recently concluded a detailed agreement with the United Kingdom for the development of an advanced lift engine for V/STOL applications. Here again we each have something to offer the other which should make our combined effort better than either of our individual efforts. The British contractor, Rolls-Royce, is the only company in the world that has had practical flying experience with jet lift engines. Through several different engine models, Rolls has provided the lift for British, German and French V/STOL's. At the same time, our engine contractors have for several years been working on advanced technology for lightweight jet engines, and four of our contractors have recently built test-rig demonstrators incorporating this technology to demonstrate thrust-to-weight ratios heretofore unattainable. The pooling of this complementary experience and knowledge, in a joint development project on an important and critical equipment, fulfills in the most direct way possible the DOD objectives of R&D cooperation.

Another kind of cooperation takes place on those things where we have each already done development and have built prototypes of equipment of mutual interest. For example, we have agreements and programs for joint flight testing of a variety of V/STOL aircraft between ourselves and Germany, France and the United Kingdom. We each will get both data and first-hand experience with aircraft that exist only in one country.

So we see that our cooperation in the development of military aircraft so far takes place in scientific interchange, in design studies, experimental fabrication, engineering design and flight evaluation.

The U.S. Ground Rules for Cooperation.

These various types of cooperation are worked out to meet the objectives and criteria specified in the DOD directive referred to before. The main ones are these:

• **First, for U.S. funds to be committed, there must be a U.S. need for the particular project.** I stress the word *need* here as contrasted to "requirement." What is meant is that there must be the same degree of firmness of application for a joint project that there is for a similar category of domestic project. The required need varies from a technical need for an exploratory development project, to a hardware evaluation need for an advanced development project, to an approved military need for an engineering development project. The fact that a project will be cooperative doesn't change our own RDT&E ground rules.

• **Second, there must be adequate value to the United States in the project.** These projects are not military assistance projects in any way and good business practice dictates that in these projects both we and our partner expect to get equivalent return. The only good contract anywhere is one that is mutually profitable.

• **Third, funding for the project must come out of the regular RDT&E funds of a Military Department.** There are no DOD funds for international programs. These projects must carry their own weight in competing within the Services for the service R&D dollars.

• **Fourth, from jointly-funded projects, the United States must obtain design and production rights equivalent to those of U.S. projects.** This means that on jointly-funded projects we will end up with a complete technical data package and with the rights that are necessary to implement the production of it. For this, we agree to pay reasonable royalties on the background work performed in the other country before the joint project, but all work that is done under joint funding gives us our normal royalty-free license to use the project for our own defense purpose includes our usual right to other contractors in the United as alternative sources of supp as we normally have the righ up second source contractors.

• **Fifth, and last, sales** of t duction resulting from coo projects must remain com This is in keeping with Se McNamara's belief in and w ward a common NATO market, based on the princi competition rather than all and arrangement.

Another important prerequi cooperation, not stated in th directive, is industrial compa meaning that the competent c tors in each case must be amon working cooperatively. No matt elaborate and harmonious the mental agreement drawn up cooperative project, the project get off the ground unless th tractors agree to do business their own governments and t in cooperation with the other g ment's contractor. We believe t usually should not be a proble cause of the increasing mut terest in the U.S. and Eu aerospace industries in joint ar ments and projects. As you several major U.S. firms have trial agreements with or owner European firms from which co tion can easily develop. Second increasing number of projec Europe are being done in coop fashion. The most outstandin ample is that of the British-l cooperation on their supersonic port, the Concorde. Following pattern are the Anglo-French ects for developing two new fighters, the Jaguar and the And in the V/STOL field, Ge and Italy are currently deve for operational use a light-v V/STOL close-support fighter VAK-191B. Each of these proj based upon industrial compatibl

Now let's take a closer look a the lift engine project satisfies ground rules.

• **Is there a U.S. need f** advanced lift engine? For a s inventory requirement at this the answer is no. For prelimina sign and component work to and size the engines that cou developed for use in V/STOL's years from now, the answer is

• **Is there value to the United** in the cooperation? The answe resounding yes. We should both better engine and save a lot of money.

• **Will it be funded out of** RDT&E funds? Yes, out of U.S Force advanced development fu

• **Will the United States ge** sign and production rights equiv to a U.S. development? Yes, the opment work will be split be Rolls-Royce and the U.S. contrac

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Changing Patterns in Management Theory

(Continued from Page 4)

courage the acceptance of authority by subordinate personnel. Authority is more meaningful when it relates to the individual's ability to build alliances within his environment and to resolve conflicts within the organization.

Decision Making in Weaponry Selection.

In the development and acquisition of weaponry, critical decisions must be made by Government and industrial leaders. The decision by the Secretary of Defense to begin development and subsequent production of a major weapon system, e.g., a ballistic missile, involves forces and factors of extraordinary proportions. Involved in the acquisition of a weapon system are a host of divergent activities such as research, engineering, test, production, operational support, etc., all of which are time-phased over the life of the system. The result is a managerial activity involving the utilization of human and non-human resources extending over several years. The protracted development time on our modern weapons systems and the huge commitment of resources involved compounds the responsibility of the decision maker. Selection of a particular weapon system today determines to a large degree the battlefield strategy that will be employed in a future war and, to some extent, our national security. Decision making in the development of weapons encompasses manifold factors of cost, technology, master scheduling, produceability, maintainability, reliability, as well as operational suitability in the intended operational environment. Moreover, there is a critical interdependence between the industrial and defense participants involved in such decisions.

In this complex management problem are the roots of the two major innovations in or extensions of traditional management theory discussed herein, i.e., *project management* and the extensive use of *quantitative analysis* for decision making. A project management structure is superimposed upon the functional organization of the parent unit to provide a focal point for the decision and execution phases of management. The nature of the management job in weapons acquisition has forced the intergation of project management innovations and quantitative analysis in a framework of traditional management theory. Organizational theory and management principles provide a basic guide to planning, organizing and controlling human and non-human resources while analysis and the accompanying use of quantitative methods provide for objectivity and the systematic and rigorous examination of the alternatives from which the manager has to choose. The truly significant result of this relationship has been the recognition that the execution aspects of management cannot be separated from analysis. A new breed of manager has been created to meet the challenge of this unique problem, one who combines the talents of the traditional manager with those of the analyst to become the *total manager*, capable of attacking the total management job!

It is superficial to view the schools of management introduced earlier as separate approaches to the management problem, or as several types of management. If they must be discussed separately at all, they should be viewed as segments of the integrated whole, segments which complement each other to fulfill that comprehensive management philosophy required of today's manager.

Quantitative Aspects of Management.

The central theme of the quantitative segment of management is the use of a formal analytical framework in the decision-making process, *usually* involving the use of quantitative methods. It is not addressed to a particular type of decision problem, i.e., that type which is predominantly concerned with variables which can be quantified, but to any type of problem. The proponents of quantitative methods are concerned about the depth of analysis for decision making and believe that a sound basic approach is the key to this depth of analysis. They would support the view of Harold Koontz quoted earlier that their philosophy does not represent a separate type of management. They would also take issue with the "tools" classification of the ideas they represent. While it is true that mathematics might logically be viewed as the tool of the analyst, the analytical approach to decision making advocated by this group cannot be viewed simply as a tool to be applied when and where the manager sees fit. Analysis must become an integral part of the management job, and the manager must be, to some extent, an analyst.

This is not to say the manager must be a professional mathematician or operations researcher. His knowledge of their areas need not be as extensive as those who specialize in this profession. He does, however, need a basic understanding of the logical processes involved, and the ability to understand and to formulate the analytical structure for his own decision. Given this level of competence, the manager can effectively utilize the professional analyst or operations researcher in his decision process. Only if he can do this can he really incorporate analysis in depth into his decision-making process. As Dr. Francis F. Bradshaw, former president of the Society for Advancement of Management, has said: "Most managers would rather live with a problem they can't solve than use a solution they don't understand." The role of the manager is that of understanding and participating in the analysis for decision making. This requires that he be able to communicate with and utilize the skills of the professional analyst.

The strongest proponents of quantitative analysis for management decisions are associated with organizations which carry a number of different titles. The most popular are Operations Research, Management Science and Systems Analysis. These terms do not have generally accepted definitions. It is possible to characterize the primary areas of interest of these groups by examining the journals carrying these titles and observing the activities of those persons who practice in these fields. One will find that in all of these fields the approach to the decision problem is identical, only the emphasis is different. A decision is viewed as the act of choosing from alternatives based on a prediction of the future consequences of each of the alternatives. The decision maker must be able to identify the alternatives open to him, make a prediction of the future consequences of each and determine a criterion upon which to base his choice. If the problem is very complex, a rigorous analysis is essential to good decision.

While the elements of a decision problem are alternatives, predictions and criteria, it is seldom that one has available any one of these elements in its entirety. A complete list of alternatives open to an individual about to make a decision would not only be impossible, it would be undesirable as it would unnecessarily complicate the decision making process. It is usually desirable to have the set of possible alternatives reduced to a workable size by elimination from consideration all but the most likely choices. Prediction of the future consequences of alternatives involves the inherent problems of predicting the future. The possibility of many outcomes always exists for each alternative and, in many cases, one is not even able to estimate with any degree of confidence the relative likelihood of the occurrence of any one of the possible outcomes. If these complexities did not complicate the decision maker's world enough, the problem of determining a suitable criterion of choice certainly would. Even in a deterministic world in which one could predict with certainty the outcome of each alternative, the criterion problem would be troublesome. Each outcome involves a cost (the expenditure of resources in the form of time, effort, or material) as well as a number of desirable and undesirable effects. Establishing a criterion for selection from such a complex of outcomes involves making value judgments and balancing conflicting goals. It is probably because of these complexities that the operations researchers, the management scientists and the systems analysts emphasize different aspects of the problem.

Operations researchers have developed into a rather highly mathematically oriented group. An examination of the *Journal of the Operations Research Society of America* will reveal that the preponderance of the articles are primarily mathematical in nature. This group tends to emphasize the development of mathematical techniques for finding optimal solutions to problems as given rather than on the development of new models for real problems.

As indicated by *Management Science*, the journal of the Institute of Management Sciences, the term management science is associated with a more problem-oriented study of the decision process. While containing a sizable amount of mathematics, the articles in this publication are addressed more directly to real world problems. The appropriateness of models for certain types of problems are examined in more detail, the reasons for examining particular models are given more emphasis. In general, it might be said that the practitioners of management science are concerned with the application of operations research methodology to real world problems, while operations researchers are concerned with the development of or improvement of the methodology.

Systems analysis, as used in the defense industry, is almost completely problem oriented. E. S. Quade of the Rand Corporation defines systems analysis as:

> ". . . inquiry to aid a decision maker choose a course of action by systematically investigating his proper objectives, comparing quantitatively where possible the costs, effectiveness and risks associated with the alternative policies or strategies for achieving them, and formulating additional alternatives if those examined are found wanting."[12]

Dr. Alain Enthoven, Assistant Secretary of Defense (Systems Analysis), differentiates between operations research and systems analysis in terms of the scope of the problem. Operations research, he describes as "optimization in the small" while systems analysis is "optimization in the large."[13]

It is apparent that all of these activities can enhance the manager's decision-making ability. Many of the lower level managerial decisions, such as inventory control or office management can be formulated in such a way that operations research methodology can be applied directly. Other problems, such as those met at the higher levels of Government are difficult, if not impossible, to formulate so to apply such methodology, but can be treated from the point of view of the systems analyst. Other managerial decision problems lie in the spectrum in between and are appropriate for quantitative analysis of some form.

What these various approaches have in common, and what is most relevant to management decision making, is: (1) a sensible approach to decision problems; (2) the use of a formal analytical framework; (3) the explicit statement of the criterion of choice or goals involved; and (4) a systematic comparison of the alternatives and a methodology for dealing with the risks and uncertainties always involved in such problems. The use of a formal analytical structure requires that one look very carefully at the nature of the decision problem. Explicit statements must be made about the relationships which exist (or are believed to exist) among the variables involved. One must differentiate between those variables over which he has control and those which are functions of forces external to his control. One of the most useful results of such structuring is that it not only requires the decision maker to state what is known about the problem, but it also requires him *to recognize what he does not know about it.*

An Example of Quantitative Analysis.

Consider, for example, the problem of deciding whether the Air Force should go ahead with plans for the development and production of a new transport aircraft, one which offers a distinct advantage over the presently used aircraft in terms of speed, payload or some other operating advantage. To arrive at a sensible answer to this problem, the decision maker must obtain information about a multitude of relevant factors and determine their proper bearing on the decision. Several significant questions are posed: How will the transport be utilized? What would be the added transport capability resulting from the addition of such an aircraft to the transport fleet? What will be the impact on costs in the long run of the alternatives of developing or not developing the proposed aircraft? When will this proposed aircraft be available, and what is the expected airlift requirement for the same period? These and many other pertinent factors which have a bearing on the problem are obviously not independent of one another, nor do they deserve equal consideration. The variables over which the decision maker has control, the specification for the aircraft design, the operating and maintenance policies, the number to be purchased, etc., all must be considered in their many combinations simultaneously with the possible values of the variables over which the decision maker has neither control nor exact knowledge. The actual requirements for airlift which will exist in the future, the technological bottlenecks or breakthroughs which may occur, the costs which will accrue and many other considerations complicate the decision maker's task. Obviously, the relationship among these variables and the goals or objectives sought by the addition of the proposed transport aircraft to the fleet must be determined or estimated.

Before the structure can be defined the decision maker must look carefully at the goals or objectives he is seeking so as to determine a criterion which will allow him to select the best alternative. It is quite important that the criterion problem be looked at as a separate item in the decision process. In the first place, the establishment of a criterion involves value judgments, i.e., the determination of the relative worth of the various outcomes. It is difficult, to separate value judgments necessary for the establishment of criteria from those judgments which relate to the prediction of the future consequences of alternative courses of action.* The former involves one's value system, his likes and dislikes, or his interpretation of the likes and dislikes of the American people. The latter involves only an objective estimate of future events. Moreover, it is difficult to distinguish between personal goals and organizational or social goals, both of which influence value judgments, even when the structure of the problem forces explicit consideration of the criterion problem separate from the prediction problem. It is nearly impossible for one to make such distinctions when this aspect of the problem is not dealt with explicitly.

Finally, the criteria or goals used in the decision-making process are the crucial links which relate the decisions made at one level in an organization to the remainder of the organization. The goals or criteria utilized by the Air Force in its decision-making process must be compatible with, and support the goals of, the Department of Defense and the entire Government. In other words, the criteria for decision must be such that it measures the contribution of the alternatives to our national goals; this is indeed a most difficult task. Involved are questions of utility, suboptimization, measures of effectiveness and cost. Explicit treatment of this aspect of the problem is essential to rational decision making.

The question of criteria in our transport aircraft example is relatively simple when compared with the same aspect of decision problems relating to tactical aircraft or infantry weapons. The contribution made by transport aircraft can be measured in terms of quantity of payload and rate of delivery. Fortunately, these quan-

[12] *Quade, E. S., "Analysis for Military Decisions," R-387-PR, Nov. 1964, The Rand Corporation, p. 4.*

[13] *Enthoven, Alain, "Systems Analysis and the Navy,"* Naval Review, *1965.*

** Note: A value judgment in this example would be an estimate of the worth of having the additional capability of the proposed aircraft. A prediction judgment would estimate the way such an aircraft would perform in an emergency.*

tities can be related to a military requirement and comparisons can be made between a complete delivery system (ships, aircraft, prepositioned stocks) which contain this transport aircraft and the complete delivery systems which do not contain this aircraft. If we expect to accomplish the same mission in either case, an obvious criterion is the delivery system which costs the least. (It should be emphasized that this choice of criterion does not imply that we are looking for the least cost delivery system; we are looking for the least cost delivery system *which will perform the missions assigned.*)

With criteria established, one can proceed to structure the problem in a way which will allow for the comparison of the various alternatives. In our transport example, the alternatives to be compared are a number of delivery systems composed of different quantities of ships, aircraft, prepositioned stock, both with and without the proposed aircraft. The calculation of the number of each component of the sytem required to do the job and the cost of such an alternative requires a considerable amount of work. One advantage of having the decision problem formally structured is that these calculations can be set up as routines; consequently, computers can be utilized to perform these menial tasks. Another advantage is that such a formal structure allows one to observe the general form of the problem and, perhaps, bring to bear some of the basic mathematical theorems and greatly simplify the comparison of alternatives. Linear programming can be utilized to examine an infinite number of alternatives and select from them one which meets the basic criterion, provided, of course, that the problem can be structured as a series of linear expressions. It should be noted, in view of some of the criticisms of quantitative management, that it is in this area of comparing multiple alternatives that mathematical methods and computers make their greatest direct contribution to the decision maker. It is apparent that when used in this way computers and mathematical techniques are only tools of the trade, not the major portion of the decision process. The really significant portion of the decision process is that of selecting the variables and relationships involved, and the structuring of the problem, the selection of a criterion and, of most importance, the handling of the risks and uncertainties involved. This approach to decision making would hardly be feasible without the availability of computers and mathematical techniques which allow for the detailed comparison of many alternatives.

The Role of Uncertainty.

Probably the most important aspect of this approach to decision making is that it emphasizes the careful consideration of the uncertainties and unknowns involved in the problem, uncertainties which are inherent in any decision problem. By the very nature of decisions, the decision maker is trying to control or manipulate the future, and his decision is based on predictions about the future consequences of several courses of action. To fail to recognize this fact and to act as if one could predict the future with accuracy would be foolish. On the other hand, one can point out that the use of analysis depends entirely upon assumptions about the future and the results of the analysis can be no better than the set of assumptions upon which it is based. This, too, is true and it leaves the decision maker in a quandary. He needs to make a set of assumptions in order to apply this approach; yet he can't possibly make the correct ones. It is in this regard that the use of the analytical approach is so valuable.

Because he is working with an analytical structure, the decision maker can test the sensitivity of his decision to changes in assumption. Suppose, for example, that in our analysis concerning the proposed transport aircraft, we are not able to determine, with any degree of certainty, the quantity and rate of delivery which wil' be required in a situation in which the transport fleet is to be utilized. It is very likely that this will indeed be the case. The amount of material delivered depends upon the type of military operation being supported, the location of the support required, the distance involved, the tactics employed, etc. The analyst can make comparisons at a number of specified loads and delivery schedules for a number of likely scenarios.[14] If it turns out that the proposed transport is a member of the most economical transport system for each of these comparisons, he can be fairly confident that the decision to go ahead with the program is not sensitive to the mission. If, on the other hand, the proposed aircraft was included in the most economical transport system for only a few of such comparisons, he would know that his decision was sensitive to variations in mission. In such cases, he could either expend effort attempting to determine with a higher degree of certainty the missions requirements, or he could examine the characteristics of the proposed aircraft to see if one with more favorable characteristics might be feasible. Similar sensitivity analysis can be conducted to determine to which of the other areas of uncertainty the decision is sensitive.

The Universal Requirement for Judgment.

The use of this approach to decision making does not, of course, provide ready made answers to the decision maker. Even with sensitivity analysis many uncertainties will exist which have not been fully resolved. There are always some aspects of decision problems which cannot be formally incorporated into the analytical framework. Nor is there any completely satisfactory measure of effectiveness for making comparisons among the alternatives. However, the use of an analysis provides a great deal of insight into the nature of the decision problem. It focuses attention on the important variables and identifies the areas where subjective judgement is required. It avoids the mixing of relevant and irrelevant information and tends to reduce the amount of emotionalism involved in such decisions.

Subjective judgments must still be made, but this approach pinpoints the factors to be judged and clearly states what judgments were utilized in the analysis—leaving them to be challenged and defended if need be. The structure of the problem allows an individual who is not an expert in all aspects of the problem to inject his judgment in those areas where his expertise is valid without attempting to relate to the other factors about which his knowledge is limited. It allows a specialist, for example, to make judgments based on this background in his specialty without becoming involved in questions of technology, cost, or politics. He is not required to make recommendations as to whether a certain weapon should be bought or not (which implies a decision on his part) but to forecast the operational consequences of the use of such a weapon.

This discussion has dwelled on the application of quantitative analysis for decisions at the higher levels of management, but the same approach can be applied to a lower level decision problem as well. It may be that there are fewer uncertainties and a less elaborate analysis may be sufficient. In some cases the problem may be so simple that the decision maker can conduct an adequate analysis without resorting to pencil and paper. Or perhaps the consequences of choosing a non-optional alternative are not serious enough to warrant a comprehensive analysis, and a decision based on past experience alone may be entirely adequate. But when the consequences are serious and the problem complex, it behooves a good manager to utilize the power of analysis.

Criticisms and Misconceptions of Quantitative Analysis.

Invariably in a discussion of this approach to the decision-making process of management a number of criticisms arise. This technique, like any other, has its shortcomings but many of these criticisms are based on misconceptions.

First is the thought that the advocates of quantitative management treat management as if it were a mathematical model waiting only for the mathematically oriented manager

[14] *Scenario is defined as an outline plan of the actions to be undertaken during a projected exercise or maneuver.*

to solve a set of equations or to perform some esoteric algebraic operation. Quantitative management is concerned almost entirely with decision making; it hardly pretends to address itself to the execution phases of management, which are clearly a significant proportion of the manager's task. Moreover, the mathematics involved are used primarily as tools of the analyst. In many cases, little or no mathematics beyond simple arithmetic or elementary algebra is required for analysis; emphasis is on the proper structuring of the problem for analysis. A solid background in mathematics can be extremely valuable in even simple analysis, and may lead to the application of some valuable mathematical technique or principle; however, the manager need not be a mathematician.

Another misconception about the use of quantitative analysis in managerial decision making is that it does not allow for judgment. This criticism has been particularly strong in regard to the use of systems analysis for decision making by the Secretary of Defense. The claim is that analysis has replaced military judgment in the formulation of our defense posture. If military judgment has been excluded from these matters, it is not because this approach does not provide for the inclusion of such judgment. Indeed, analysis not only requires that military judgment be exercised, but sharpens the areas in which such judgment must be made. It tends to separate those factors in a decision problem in such a way that judgments can be made separately, by experts, rather than requiring an expert in one field to judge economic, military, political and other factors simultaneously. It also helps to separate value judgments from those judgments related to the forecasting of the consequences of particular courses of action. Moreover, it tends to reduce the area in which subjective judgments are required and to identify clearly and expose such judgments for criticism and debate. A procedure which either ignores the requirement for such judgments, or allows the analyst to make and bury such judgments would clearly be a dangerous one. That such a procedure is suggested by the use of quantative analysis is clearly a misconception.

Another criticism based on misconception is that quantitative analysis results in turning problems over to electronic computers for solution. Such ideas not only indicate a misunderstanding of quantitative analysis but of computers as well. The role of the computer in quantitative analysis is an important one. The main use of the computer is for performing routine calculations which would require a great deal of manpower and time if the computer were not available. The fact that computers can be utilized for this purpose makes it economical for many alternatives to be explored in depth and, consequently, for the analysis to be much more complete than would otherwise be possible. Viewing the computer as a decision maker, however, is completely absurd. Computers can only perform routine calculations and then only after a programmer has carefully provided instructions on every minute detail of the calculation procedure. The extent of their decision-making capability is to distinguish between signs (+, −, 0) and perform some clearly defined routine as the result of each. More important to this argument, however, is the fact that the essential portion of this approach is the structuring of the decision problem and in the interpretation of results, neither of which involve the use of computers. The relative importance of the computer in quantitative analysis is quite small.

One other aspect of quantitative analysis for decision making which appears to be generally misunderstood is the use of cost effectiveness studies in the Department of Defense. There is a tendency to equate cost effectiveness with a decision procedure which selects the cheapest system. The truth of the matter is that cost effectivness studies, a particular form of quantitative analysis used throughout the Department of Defense, does not mean that at all. It means taking the least cost alternative *of those alternatives which are equally effective*. There is quite a difference in the two statements, and one would have great difficulty in arguing against the latter. This should not be interpreted as an over emphasis on cost, or as assigning first priority to cost and second to effectiveness, but of balancing cost with effectiveness, at least conceptually. It merely says what our military and civilian leaders have said all along, "Let's do our job, but let's do it at the lowest cost." The difference is that quantitative analysis allows us to attempt to find the lowest cost way of doing the job. Without such analysis, these words are without meaning.

Demands on the Total Manager.

The job that we have outlined here for the *total manager* is not an easy one. We are insisting that he not only be an expert in traditional management practices, but also that he have some competency in quantitative analysis. He cannot afford to view qualitative vs. quantitative as two distinct types of management but must accept them as segments of the whole which complement each other. Only a management philosophy developed on this basis is adequate for today's Defense-industrial management task.

Management relationships and problems are changing as new theories and techniques are formulated. Principles of management established a few years ago may become inadequate as the environment changes. No doubt schools of management will continue to evolve as we become knowledgeable about the structure and dyn[...] our industrial and Defense [...] The manager must maint[...] pragmatism and utilize the [...] tions of all the schools in [...] support the making and exec[...] decisions in an environment [...] risk and uncertainty. His [...] ment philosophy must chang[...] the changing patterns in mana[...]

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"Why Vietnam" Film Available

'Why Vietnam," a 32-minute black l white motion picture which out-es U.S. policy in that country, is v available for public non-profit wing.

'he 16mm film opens with Presi-t Johnson's news conference state-it to the nation of July 28, 1965, elaborates on the basic points he ussed. Scenes from the struggle in tnam illustrate the various points le by the President.

ecretary of State Dean Rusk and ense Secretary Robert S. McNa-'a are also featured in the film, ch was produced by Armed Forces ormation and Education, Depart-t of Defense.

rints of "Why Vietnam" can be owed by civilian organizations free harge. Requests should be sent to Army Audio-Visual Support Cen-supporting the area in which you located (check list below).

'ints may also be purchased from rt Film Laboratories, Inc., 245 t 55th Street, New York, N.Y.

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o Speakers

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ms of the Air Force Systems Logistics Commands:
akers: (At all five cities)
. Robert H. Charles, Asst. Sec-etary of the Air Force (Installa-ons & Logistics).
Gen. W. A. Davis, USAF, Vice-ommander, Air Force Systems ommand (AFSC).
. Gen. Marvin C. Demler, SAF, Commander, Research & echnology Div. (AFSC).
. Gen. Jack J. Catton, USAF, ir., Operational Requirements & evelopment Plans, Hq., USAF.
. Gen. Gerald F. Keeling, USAF, CS/Procurement & Production AFSC).
. Gen. Robert H. McCutcheon, SAF, Dir., Procurement and oduction, Air Force Logistics ommand.

Procurement Conferences Set for Texas & Iowa

Two procurement information conferences have been slated for February in El Paso, Tex., and Council Bluffs, Iowa, to aid industry development.

A Procurement Clinic, sponsored by the El Paso Chamber of Commerce, the El Paso Board of Development and Industrial Development Corporation of El Paso, will be held Feb. 10.

A Procurement and Industrial Development Conference will also be held Feb. 24 in Council Bluffs, Iowa.

For information on the two conferences contact Donald Holinberg, Executive Vice President, Chamber of Commerce, P.O. Box 682, El Paso, Tex., or William Keister, Box H, Council Bluffs, Iowa.

Springfield Armory to be Phased Out

Defense Secretary McNamara has directed that all activities at the Springfield Armory in Massachusetts be phased out over the next two and a half years in accordance with the original decision to close down the activity announced last year.

The reaffirmation of the decision follows a comprehensive study by the Booz, Alen & Hamilton firm of management consultants which concluded that the long-range retention of the Springfield Armory for the acquisition of small arms and weapons systems is neither necessary nor desirable.

The study further stated the Armory's manufacturing capacity and development capability are not needed.

As in the case in similar inactivations of surplus facilities, all career employees whose jobs are eliminated will be offered another job opportunity. If the new job requires a move to another location, the moving expenses involved will be borne by the Government. The services of the DOD Office of Economic Adjustment will be made available to the community, if requested.

Executive Secretary of DIAC Appointed

Clyde Bothmer, former Director of the National Aeronautics and Space Administration's Office of Industrial Affairs, has been selected as Executive Secretary of the Defense Industry Advisory Council.

Bothmer succeeds Samuel W. Crosby, who resigned from the position last September.

The council was established in May 1962, and has provided an important forum for discussions by the Secretary of Defense and his principal management assistants with leaders selected from business and industry.

Amphibious Warfare Classified Briefing Set

Amphibious warfare will be the subject of a classified briefing for industry sponsored by the Navy, Marine Corps and Electronic Industries Association, March 1-3, 1966.

The meeting will be held at the Naval Amphibious Base, Coronado, San Diego, Calif. For program security forms and pre-registration information contact Mr. John Sodolski, Electronic Industries Association, 2001 Eye St., N.W., Washington, D.C. 20006, (Area Code 202) 659-2200.

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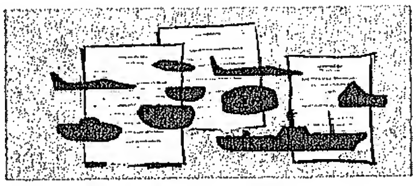

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of December 1965:

DEFENSE SUPPLY AGENCY

2—**Standard Oil Co. of Calif.**, San Francisco. $1,850,000. 13,088,100 gallons of RP-1 rocket fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Blue Star Foods, Inc.**, Council Bluffs, Iowa. $1,962,262. 3,218,080 cans of hamburger patties. Defense Personnel Support Center, Philadelphia.

3—**Delta Petroleum Co.**, New Orleans. $2,710,792. 6,318,372 gallons of lubricating oil for aircraft engines. Defense Fuel Supply Center, Alexandria, Va.

7—**Pacific Mills Division of Burlington Industries** Halifax, Va. $1,983,400. 470,000 yards of wool gabardine cloth. Raeford, N.C. and Clarksville, Va. Defense Personnel Support Center, Philadelphia.

—**J. P. Stevens, Inc.**, New York City. $1,905,260. 436,000 yards of wool gabardine cloth. Sumpter and Wallace, S.C. Defense Personnel Support Center, Philadelphia.

8—**Univac Division of Sperry Rand Corp.**, Washington, D.C. $1,571,760. Data processing equipment. Washington, D.C. Defense Construction Supply Center, Columbus, Ohio.

—**Southern Athletic Co.**, Knoxville, Tenn. $1,376,320. 147,200 men's light-weight raincoats. Knoxville. Defense Personnel Support Center, Philadelphia.

13—**Coastal States Petrochemical Co.**, Houston, Tex. $4,854,234. 1,100,000 barrels of type I, motor gasoline (86/9 octane). Defense Fuel Supply Center, Alexandria, Va.

14—**Southern Athletic Co.**, Knoxville, Tenn. $1,586,953. 251,040 men's nylon sateen field coats. Knoxville. Defense Personnel Support Center, Philadelphia.

—**Oscar Mayer and Co.**, Madison, Wis. $1,713,262. 973,500 pounds of canned sliced bacon. Madison. Defense Personnel Support Center, Philadelphia.

15—**DeRossi & Son Co.**, Vineland, N.J. $1,987,500. 150,000 men's wool serge coats. Vineland. Defense Personnel Support Center, Philadelphia.

—**Tursini & Co.**, Vineland, N.J. $1,044,000. 75,000 men's wool serge coats. Vineland. Defense Personnel Support Center, Philadelphia.

16—**Cherubino Petti & Co.**, Atlantic City, N.J. $1,783,500. 80,000 men's wool coats. Atlantic City. Defense Personnel Support Center, Philadelphia.

17—**American Oil Co.**, Chicago. $2,265,816. 500,000 barrels of octane gasoline. Defense Fuel Supply Center, Alexandria, Va.

21—**Tennessee Overall Co.**, Tullahoma, Tenn. $1,035,555. 508,500 men's cotton polyesterene twill trousers. Tullahoma. Defense Personnel Support Center, Philadelphia.

22—**A.M. Ellis Hosiery Co.**, Philadelphia. $1,155,040. 1,600,000 pairs of men's socks. Defense Personnel Support Center, Philadelphia.

23—**Ingersoll Products Division, Borg-Warner Corp.**, Chicago. $1,372,000. 400,000 soldiers' steel helmets. Chicago. Defense Personnel Support Center, Philadelphia.

—**Coastal States Petrochemical Co.**, Houston, Tex. $1,970,640. 510,000 barrels of diesel fuel. Houston. Defense Fuel Supply Center, Alexandria, Va.

27—**Bonham Mfg. Co.**, Bonham, Tex. $2,008,195. 350,000 men's cotton poplin wind-resistant coats. Bonham. Defense Personnel Support Center, Philadelphia.

—**Supreme Mfg. Co.**, Dallas, N.C. $1,454,481. 3,071,760 men's crew-neck undershirts. Dallas. Defense Personnel Support Center, Philadelphia.

—**Southern Packaging and Storage Co.**, Greenville, Tenn. $1,310,164. 2,014,526 cases of individual combat meals. Greenville, Tenn. and Mullins S.C. Defense Personnel Support Center (Chicago Subsistence Regional Office).

29—**Addison Shoe Corp.**, Wynne, Ark. $1,835,000. 250,000 pairs of combat boots. Wynne. Defense Personnel Support Center, Philadelphia.

—**H. H. Brown Shoe Co.**, Worcester, Mass. $1,089,200 140,000 pairs of combat boots. Worcester. Defense Personnel Support Center, Philadelphia.

—**Safety First Shoe Co.**, Nashville, Tenn. $1,648,123. 233,280 pairs of combat boots. Huntsville, Ala. Defense Personnel Support Center, Philadelphia.

—**Sportwelt Shoe Co.**, Nashua, N.H. $1,101,000. 150,000 pairs of combat boots. Newport, N.H. Defense Personnel Support Center, Philadelphia.

—**Kaiser Steel Corp.**, Fabricating Div., Fontana, Calif., $10,551,940. 46,000 landing mat sets. Fontana. Defense Construction Supply Center, Columbus, Ohio.

—**Republic Steel Corp.**, Manufacturing Div., Youngstown, Ohio. $5,984,160. 26,000 landing mat sets. Youngstown. Defense Construction Supply Center, Columbus, Ohio.

—**J. B. Roerig and Co.**, Division of Charles Pfizer and Co., New York City. $1,244,973. 529,776 bottles of tetracycline hydrochloride tablets. New York City. Defense Personnel Support Center, Philadelphia.

ARMY

1—**Research Analysis Corp.**, McLean, Va. $1,240,000. Military operations research. McLean. Defense Supply Service, Washington, D.C.

—**Laboratory for Electronics, Inc.**, Boston, Mass. $3,194,000. Airborne receivers for UH-1 and CH-47 helicopters. Danvers, Mass. Army Electronics Command, Philadelphia.

—**Wilkinson Mfg. Co.**, Fort Calhoun, Neb. $1,842,800. Ordnance items. Fort Calhoun. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**REDM**, Wayne, N.J. $1,870,000. Ordnance. Wayne. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**I.D. Precision Components Corp.**, Jamaica, N.Y. $1,768,000. Ordnance items. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Action Mfg. Co.**, Philadelphia. $1,883,600. Ordnance. Philadelphia. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Columbus Milpar**, Columbus, Ohio. $1,800,300. Ordnance items. Columbus. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Tire & Rubber Co.**, Akron, Ohio. $1,112,788. Ordnance items. Akron. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Instrument Corp.**, Chicopee, Mass. $2,367,052. Ordnance items. Joliet, Ill. and Chicopee. Ammunition Procurement & Supply Agency, Joliet, Ill.

2—**W. R. Grimshaw Construction Co.**, Houston, Tex. $1,772,000 (NASA funds). Construction of the technical services facility at the Manned Spacecraft Center, Clearlake, Tex. Engineer Dist., Fort Worth, Tex.

3—**Mine Safety Appliances Co.**, Pittsburgh, Pa. $1,200,807. Items for chemical agent detector kits, refill kits and clips. Pittsburgh. Edgewood Arsenal, Md.

—**Cooperweld Steel Co.**, Glassport, Pa. $6,742,270. Wire mesh fabric and forms for the Mississippi River and Tributaries Project. Glassport. Engineer Dist., Memphis, Tenn.

—**Magnavox Co.**, Urbana, Ill. $5,641,432. Gun direction computers. Urbana. Frankford Arsenal, Philadelphia.

—**International Harvester Co.**, Washington, D.C. $1,758,751. Tractor trucks. Fort Wayne, Ind. Army Ta
Center, Warren, Mich.

6—**Troup Bros.**, Coral Cables,
Work on Central and S
Flood Control Project, Da
Engineer Dist., Jacksonvill

—**Arundel Corp.**, Baltimore,
Work on Central and S
Flood Control Project in
Martin counties. Engineer
ville, Fla.

—**University of Michigan**, A
$1,320,000. Design, develo
computer program servic
Defense Supply Service, V

—**Douglas Aircraft**, Santa
$2,450,000. Work on a cl
project. Santa Monica.
Command, Huntsville, Ala.

—**SCM Corp.**, Deerfield, Ill.
typewriter sets and re
mitter teletypewriters. I
Electronics Command, Ph

7—**Colt, Inc.**, Hartford, Cc
5.56mm rifles. Hartford.
Command, Rock Island, Ill

—**R. G. LeTourneau, Inc.**,
$1,198,420. Ordnance it
Ammunition Procureme
Agency, Joliet, Ill.

8—**Kaiser Jeep Corp.**, Toledo,
2½-ton trucks. South Be
Purpose Vehicle Project M
Mich.

—**Raytheon Co.**, Lexington,
Development of self-pr
modification to the HAWK
Bedford, Mass. Army M
Redstone Arsenal, Huntsv

9—**General Motors**, Detriot,
8-cylinder diesel engines.
Tank Automotive Center,

—**Harrington & Richardson**,
Mass. $1,345,733. 7.62m
and two sets of final insp
Worcester. Army Wea
Rock Island, Ill.

—**Delong Corp.**, New York
Delong pier approach and
accessory equipment. N
Army Mobility Equipm
Louis.

10—**Standard Products Co.**,
$5,105,050. Rubber track
for M113 vehicles. Por
Army Tank Automotive
Mich.

—**FMC Corp.**, Charleston, W
Rubber track shoe asse
vehicles. Charleston. A
motive Center, Warren, M

—**Firestone Tire & Rubber**
$3,056,505. Rubber track
for M113 vehicles. Nobles
Tank Automotive Center,

—**Cook Construction Co.**,
$1,109,673. Work on the
Jackson, Mississippi, Loc
tion Project. Engineer D

—**Stewart-Erickson Co.**, Se
770,807. Work on the I
Renewal Project, Anc
Engineer Dist., Anchorag

—**Hercules Construction Co**
$1,551,991. Work on St.
Protection Project. Eng
Louis.

—**Raven Industries**, Sioux F
000. Ordnance items. S
munition Procurement &
Joliet, Ill.

—**Olin Mathieson Chemical**
Ill. $1,866,712. $1,853,743
20 and 7.62mm cartri
Frankford Arsenal, Phila

13—**General Motors**, Detroit.
cylinder engines for t
8-inch howitzer, the self-
gun and the recovery
Army Tank Automotive
Mich.

—**Electronic Assistance Cor**
$5,223,276. Radio rece
Army Electronics Comma

—**Terminal Construction Corp.**, Wood-Ridge, N.J. $3,500,000. Construction of troop housing and supporting facilities at Fort Dix, N.J. Engineer Dist., New York City.

—**J.J. Fritch & Co.**, Dallas Tex. $3,100,040. Construction of five tactical equipment shops, and facilities, at Fort Hood, Tex. Engineer Dist., Fort Worth, Tex.

—**Radiation, Inc.**, Melbourne, Fla. $1,998,427. Satellite communications terminals (AN/TSC 54) MARK IV. Melbourne. Army Electronics Command, Fort Monmouth, N.J.

—**R. G. LeTourneau, Inc.**, Longview, Tex. $3,579,740. Ordnance items. Longview. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Honeywell, Inc.**, Hopkins, Minn. $2,018,-608. Ordnance items. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

15—**Bendix Corp.**, Teterboro, N.J. $10,048,070. Guidance & control components for the PERSHING missile system. Teterboro. Army Missile Command, Huntsville, Ala.

—**General Motors Corp.**, Allison Div., Warren, Mich. $17,016,613. Continuation of Phase III, US FRG Main Battle Tank Development Program. Milwaukee, Wis.; Detroit, Mich. and Warren. Army Tank Automobile Center, Warren, Mich.

—**Bendix Corp.**, York, Pa. $7,202,975. Ordnance items. York. Harry Diamond Laboratories, Washington, D.C.

—**General Motors Corp.**, Detroit. $3,258,813. Six-cylinder diesel engines. Detroit. Army Tank Automotive Center, Warren, Mich.

16—**Hercules Powder Co.**, Wilmington, Del. $1,999,107. Propellants and operations and maintenance. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Raytheon Co.**, Lexington, Mass. $1,073,272. HAWK field service documentation during FY 66. Andover, Mass. Army Missile Command, Huntsville, Ala.

—**Berry Construction Co.**, Decatur, Ill. $1,-090,480. Work on Shelbyville, Reservoir, Ill., Project. Engineer Dist., St. Louis.

17—**Firestone Tire & Rubber Co.**, Akron, Ohio. $4,697,239. Tires for trucks and trailers. Decatur, Ill. and Pottstown, Pa. Army Tank Automobile Center, Warren, Mich.

—**Mansfield Tire & Rubber Co.**, Mansfield, Ohio. $1,008,887. Tires for ¾-ton trucks and trailers. Mansfield. Army Tank Automotive Center, Warren, Mich.

—**Zenith Radio Corp.**, Chicago. $2,090,200. Sensing element proximity fuzes. Chicago. Picatinny Arsenal, Dover, N.J.

—**General Motors**, Diesel Engine Div., Detroit. $1,071,000. 120 multi-purpose 100 KW generator sets. Detroit. Army Mobility Equipment Center, St. Louis.

20—**Raytheon Co.**, Lexington, Mass. $1,155,580. Selected items of ground support equipment for the HAWK missile system. Waltham and Andover, Mass. Army Missile Command, Huntsville, Ala.

—**Emerson Electric Co.**, St. Louis. $2,627,-000. Helicopter ordnance items. St. Louis. Army Weapons Command, Rock Island, Ill.

—**Harvey Aluminum Co.**, Torrance, Calif. $1,720,543. Fuzes and fuze spare parts. Torrance. Frankford Arsenal, Philadelphia.

21—**General Electric**, Nashville, Tenn. $2,615,-316. Design, manufacture, delivery and installation of 3 generators for the Cordell Hull Dam. Design & manufacture will be done at Schenectady, N.Y. and Waynesboro, Va. Delivery and installation will be to the Cumberland River Project, Tenn. Engineer Dist., Nashville, Tenn.

—**Colt's Inc.**, Hartford, Conn. $1,855,550. Repair parts for M16 and XM16E1 5.56mm rifles. Hartford Army Weapons Command, Rock Island, Ill.

—**Bell Helicopter Co.**, Division of Bell Aerospace Corp., Fort Worth, Tex. $1,372,091 and $4,709,781. Rotor blade assemblies for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.

22—**Kisco Co.**, St. Louis. $6,047,617. 105mm cartridge cases. St. Louis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Union Carbide Corp.**, Consumer Products Div., New York City. $1,037,416. Dry cell batteries and tactical radio sets. New York City. Army Electronics Command, Philadelphia.

—**Daifield Industries**, Carrollton, Tex. $1,-239,000. 600 half-ton utility trucks. Carrollton. Army Tank Automotive Center, Warren, Mich.

—**Continental Motors**, Muskegon, Mich. $4,-119,220. Engine assembly and connecting parts for transmissions used on the M60A1 tank. Muskegon. Army Tank Automotive Center, Warren, Mich.

—**Bell Helicopter Co.**, Division of Bell Aerospace Corp., Fort Worth, Tex. $1,276,268. Gear box assemblies for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.

23—**Associated Spring Corp.**, Wallace Barnes Div., Bristol, Conn. $1,318,475. 20mm link cartridge belts. Frankford Arsenal, Philadelphia.

—**Mohawk Rubber Co.**, Akron, Ohio. $1,658,-200. 2½-ton truck tires. Akron. Army Tank Automotive Center, Warren, Mich.

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $2,128,320. 2½-ton truck tires. Akron. Army Tank Automotive Center, Warren, Mich.

—**Liles Construction Co.**, Montgomery, Ala. $1,759,040. Construction of airmen's dormitories and dining hall at MacDill AFB, Fla. Engineer Dist., Jacksonville, Fla.

—**Hughes Tool Co.**, Aircraft Div., Culver City, Calif. $2,859,280. TH-55A (Primary Trainer) helicopters. Culver City. Army Aviation Materiel Command, St. Louis.

—**KDI Corp.**, Cincinnati, Ohio. $1,196,273. M423 fuze metal parts. Cincinnati. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Gibbs Mfg. Co.**, Janesville, Wis. $1,147,-838. M423 fuze metal parts. Janesville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**AVCO Corp.**, Ordnance Div., Richmond, Ind. $1,210,487. M423 fuze metal parts. Richmond. Ammunition Procurement and Supply Agency, Joliet, Ill.

—**Hamilton Watch Co.**, Lancaster, Pa. $1,-241,813. M423 fuze metal parts. Lancaster. Ammunition Procurement and Supply Agency, Joliet, Ill.

—**General Time Corp.**, Westclox Div., La Salle, Ill. $1,315,426. M423 fuze metal parts. La Salle. Ammunition Procurement and Supply Agency, Joliet, Ill.

27—**Western Electric**, New York City. $92,-814,791. NIKE-X research and development. Burlington, N.C.; Winston-Salem, N.C.; Allentown, Pa.; Greensboro, N.C.; and Laureldale, Pa. NIKE-X Project Officer, Redstone Arsenal, Huntsville, Ala.

—**Bell Helicopter Division of Bell Aerospace Corp.**, Fort Worth, Tex. $3,550,872 and $1,825,691. Rotary wing blades for UH-1 helicopters and tail boom assemblies for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—**Honeywell, Inc.**, Hopkins, Minn. $2,289,-962. M561 fuze metal parts. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

28—**Kaiser Aluminum & Chemical Sales Div.**, Oakland, Calif. $25,084,498. MX 19 aluminum honeycomb core airplane landing mats. Berkeley and San Diego, Calif. Army Engineer Waterways Experiment Station, Vicksburg, Miss.

—**Ford Motor Co.**, Dearborn, Mich. $2,877,-004. Carry-all, cargo and panel trucks. Dearborn. Army Tank Automotive Center, Warren, Mich.

—**Raymond Engineering Laboratories**, Middletown, Conn. $1,002,131. M414 fuze parts. Middletown. Harry Diamond Laboratories, Washington, D.C.

29—**Parsons Mfg & Stamping Co.**, Cordova, Tenn. $1,226,800. Ordnance items. Cordova. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**American Fabricated Products Co.**, Indianapolis. $1,214,329. Ordnance items. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Raytheon Co.**, Lexington, Mass. $4,658,097. Maintenance and modification of special tooling and test equipment to support the HAWK missile system. Lexington. Army Missile Command, Huntsville, Ala.

—**Raytheon Co.**, Lexington, Mass. $4,663,188. FY 1966 industrial engineering services for the HAWK missile system. Lexington. Army Missile Command, Huntsville, Ala.

—**FMC Corp.**, San Jose, Calif. $1,444,452. Ordnance items. San Jose. Picatinny Arsenal, Dover, N.J.

—**Honeywell, Inc.**, Hopkins, Minn. $1,024,-000. Research and development of classified ammunition. Hopkins. Picatinny Arsenal, Dover, N.J.

—**Johnson Furnace Co.**, Bellevue, Ohio. $1,-438,010. ¼-ton trailers and trailer chassis. Bellevue. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Chevrolet Motor Div., Detroit. $11,531,154. Various types of commercial trucks. Detroit. Army Tank Automotive Center, Warren, Mich.

—**Wagner Electric Co.**, St. Louis. $2,125,240. 4.2-inch mortar projectile parts. St. Louis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Kennedy Van Saun Corp.**, Danville, Pa. $1,999,280. 4.2-inch mortar projectile parts. Danville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**International Harvester Co.**, Washington, D.C. $1,915,642. Various model trucks. Fort Wayne, Ind. Army Tank Automotive Center, Warren, Mich.

30—**Bell Aerosystems Co.**, Division of Bell Aerospace Corp., Buffalo, N.Y. $1,997,060. Exploratory development of an individual lift device system. Buffalo, N.Y. and Walled Lake, Mich. Army Aviaion Material Command, St. Louis.

—**General Electric Co.**, Missile & Armament Dept., Burlington, Vt. $3,734,686. Ordnance items. Burlington. Army Weapons Command, Rock Island, Ill.

—**Martin Zachry Constructors**, Honolulu, Hawaii. $3,394,065. Construction of NIKE-ZEUS, NIKE-X and PRESS (Pacific Range Electromagnetic Signature Study) facilities at Kwajalein Atoll, Marshall Islands. Engineer Dist., Honolulu.

—**Westrex Communications Division of Litton Systems, Inc.**, New Rochelle, N.Y. $6,926,-247. Radio transmitters and receiving equipment. Pelham Manor, N.Y. Army Electronics Command, Philadelphia.

—**Philco Corp.**, Newport Beach, Calif. $71,-393,000. FY 1966 production of the SHILLELAGH missile system. Lawndale, Calif. Army Missile Command, Huntsville, Ala.

—**Eby & Associates of Arkansas**, Wichita, Kan. $14,218,960. Work on Lock and Dam #9, Arkansas River Project. Morrilton, Ark. Engineer Dist., Little Rock, Ark.

—**Collins Radio Co.**, Dallas, Tex. $9,046,290. Long line microwave system for the Republic of Korea Army and Korean Ministry of Communications. Dallas and Richardson, Tex. Army Electronics Command, Fort Monmouth, N.J.

—**ITT Gilfillan, Inc.**, Los Angeles. $1,050,000. Ground radar sets. Los Angeles. Army Electronics Command, Fort Monmouth, N.J.

—**Philco Corp.**, Newport Beach, Calif. $3,-316,601. Adaptation of a classified quantity of the SHILLELAGH missiles to the Main Battle Tank. Newport Beach. Army Southwest Procurement Agency, Pasadena, Calif.

—**Philco Corp.**, Newport Beach, Calif. $7,-752,625. SHILLELAGH industrial engineering support. Newport Beach. Army Southwest Procurement Agency, Pasadena, Calif.

—**General Motors**, Chevrolet Div., Detroit. $1,444,482. 4X2 school buses. Richmond, Ind. and Conway, Ark. Army Tank Automotive Center, Warren, Mich.

—**International Harvester Co.**, Washington, D.C. $3,253,300. Various sizes of tractor dump trucks. Fort Wayne, Ind. and Springfield, Ohio. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Chevrolet Div., Detroit. $4,088,636. Stake and platform trucks. Baltimore, Md. and St. Louis. Army Tank Automotive Center, Warren, Mich.

—**International Harvester Co.**, Washington, D.C. $1,870,503. School buses. Richmond, Ind. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Chevrolet Div., Detroit. $5,017,492. 4-door automobile sedans. Boxwood Road, Del. Army Tank Automotive Center, Warren, Mich.

—**Pace Corp.**, Memphis, Tenn. $2,102,048. Aerial photoflash cartridges. Memphis. Army Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Amron Corp.**, Waukesha, Wis. $1,708,454. 40mm cartridge cases. Waukesha. Army Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Bulova Watch Co.**, Jackson Heights, N.Y. $1,282,088. M423 fuze metal parts. Jackson Heights. Army Ammunition Procurement & Supply Agency, Joliet, Ill.

—**AiResearch Mfg. Co.**, Division of the Garrett Corp., El Segundo, Calif. $1,377,-290. 60KW gas turbine generator sets.

El Segundo, Calif. and Phoenix, Ariz. Army Mobility Equipment Center, St. Louis.

—Eagle Engineering Mfg. Co., Louisville, Ky. $2,792,803. 3KW, 60-cycle, AC air-cooled generator sets. Louisville. Army Mobility Equipment Center, St. Louis.

NAVY

2—Farmer Tool Co., Denver, Colo. $2,701,800. Nozzle and fin assemblies for 2.75-inch rockets. Denver. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Applied Science Industries, Falls Church, Va. $1,863,000. Nozzle and fin assemblies for 2.75-inch rockets. Falls Church. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Muncie Gear Co., Muncie, Ind. $6,303,816. 2.75-inch rocket nozzle and fin assemblies. Muncie. Navy Ships Parts Control Center, Mechanicsburg, Pa.

3—Sperry Rand Corp., Great Neck, N.Y. $12,263,103. Prototype sonar system kits. Great Neck. Bureau of Ships.

—Admiral Corp., Chicago. $1,165,000. Classified electronics equipment. Chicago. Bureau of Ships.

—Garrett Corp., AiResearch Mfg. Co. Div., Torrance, Calif. $1,375,000. Computers for F-4B aircraft. Torrance. Navy Aviation Supply Office, Philadelphia.

6—Defoe Shipbuilding Co., Bay City, Mich. $4,182,392. Construction of a small surveying ship (AGS). Bay City. Bureau of Ships.

7—General Instruments, Inc., Hicksville, N.Y. $1,249,873. Classified electronics equipment. Hicksville. Bureau of Ships.

—Huber, Hunt and Nichols, Inc., Santa Clara, Calif. $14,059,000. Construction of a 650-bed hospital at the Naval Hospital, Oakland, Calif. Dir., Western Div., Bureau of Yards and Docks.

—Douglas Aircraft, Long Beach, Calif. $2,892,606. Countermeasure sets. Long Beach. Bureau of Naval Weapons.

—PRD Electronics, Inc., Westbury, N.Y. $1,499,000. FY 66 research & development on VAST (Versatile Avionics Shop Test Equipment). Westbury. Bureau of Weapons.

—North American Aviation, Inc., McGregor, Tex. $5,362,026. Rocket motors for Sparrow and Shrike missiles. McGregor. Bureau of Naval Weapons.

—Raytheon Co., Lexington, Mass. $3,715,636. Airborne radar sets for the Navy and Air Force. Bristol, Tenn and Waltham, Mass. Bureau of Naval Weapons.

—Western Electric Co., New York City. $1,298,010. Engineering services on the TERRIER, TARTAR and TALOS missile systems. New York City. Bureau of Naval Weapons.

8—R. D. Lambert and Sons, Norfolk, Va. $1,474,333. Construction of a technical training building at the Fleet Training Center, Norfolk, Va. Dir., Atlantic Div., Bureau of Yards and Docks.

—Texas Instruments, Inc., Dallas, Tex. $2,189,306. Classified submarine equipment. Dallas. Bureau of Ships.

—Hawaiian Dredging and Construction Co., Honolulu, Hawaii. $1,919,000. Construction of a Pacific Fleet Tactical Range at Kauai Island, Hawaii. Officer in Charge of Construction, Mid-Pacific Div., Bureau of Yards and Docks.

9—Universal Match Corp., Ferguson, Mo. $9,119,701. ASROC launchers. Ferguson. Navy Purchasing Office, Washington, D.C.

10—M.I.T., Cambridge, Mass. $3,000,000. Tactical engineering support for POLARIS guidance systems. Cambridge. Special Projects Office.

—General Precision, Inc., Binghampton, N.Y. $3,823,657. Production units of the F-4D weapon system training sets. Binghampton. Naval Training Device Center, Port Washington, N.Y.

11—Bethlehem Steel Co., San Francisco. $2,438,960. Activation of the tank landing ship USS JENNINGS COUNTY (LST-846). San Francisco. Industrial Manager, Twelfth Naval District.

—Pacific Ship Repair Co., San Francisco. $1,776,000. Activation of the tank landing ship USS HUNTERDON COUNTY (LST-838). San Francisco. Industrial Manager, Twelfth Naval District.

13—American Metal Fabricators Co., Bristol, Pa. $1,272,803. Steel pallets for bomb storing and shipping. Bristol. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Sanders Associates, Nashua, N.H. $3,352,724. Evaluation and repair of government owned electronic equipment. Nashua. Bureau of Naval Weapons.

14—North American Aviation, Columbus, Ohio. $7,632,000. T-2B BUCKEYE aircraft. Columbus. Bureau of Naval Weapons.

—ITT Gilfillan, Inc., Los Angeles. $2,114,062. Service test model radar set, repair parts and engineering services. Los Angeles. Bureau of Ships.

16—Lear Siegler, Inc., Anaheim, Calif. $1,799,158. Anti-submarine warfare instrumentation system. Anaheim. Navy Purchasing Office, Los Angeles.

17—General Electric, Schenectady, N.Y. $2,050,900. Design and furnish reactor plant equipment for naval nuclear powered ships. Schenectady. Bureau of Ships.

—Master Mfg. Co., Hutchinson, Kan. $2,095,000. Ordnance production line equipment. Hutchinson. Navy Air Engineering Center, Philadelphia.

—Sperry Gyroscope Co., Syosset, N.Y. $1,850,000. Development of instrumentation & control subsystem for the nuclear powered deep submergency research and ocean engineering vehicle (NR-1). Syosset. Special Projects Office.

—General Instrument, Inc., Hicksville, N.Y. $3,148,050. Classified electronics equipment. Hicksville. Bureau of Ships.

—Westinghouse Electric Corp., Washington, D.C. $3,740,899. Steam turbine generator sets for naval ships. Sunnyvale, Calif. Bureau of Ships.

20—Gyrodyne Company of America, St. James, N.Y. $1,000,000. Long lead time items for QH-50D helicopters. St. James. Bureau of Naval Weapons.

21—RCA, Camden, N.J. $5,000,000. Radio sets and associated parts. Camden. Bureau of Ships.

—Motorola, Inc., Military Electronics Div., Scottsdale, Ariz. $4,406,018. Guidance & control systems for the SIDEWINDER missile. Scottsdale. Bureau of Naval Weapons.

—Kearney & Trecker Corp., Milwaukee, Wis. $1,086,041. Tape controlled drilling, milling, tapping and boring machines for parts production of aircraft undergoing overhaul and repair. Milwaukee. Navy Purchasing Office, Washington, D.C.

22—Douglas Aircraft, Long Beach, Calif. $1,960,000. Production of A-4E and TA-4E aircraft. Long Beach. Bureau of Naval Weapons.

23—University of Washington, Seattle, Wash., Applied Physcis Lab. $2,474,000. Research & development in the field of underwater ordnance. Seattle. Bureau of Naval Weapons.

—Bendix Corp., Eclipse Pioneer Div., Teterboro, N.J. $3,175,000. Amplifiers and computers used in navigational computer sets on board Navy Aircraft. Teterboro. Navy Aviation Supply Office, Philadelphia.

27—Honeywell, Inc., Minneapolis, Minn. $42,573,742. Production of MK 46 MOD 1 torpedoes. Hopkins, Minn. Bureau of Naval Weapons.

—Aerojet General Corp., Azusa, Calif. $64,965,121. Production of MK 46 MOD 1 torpedoes. Azusa. Bureau of Naval Weapons.

—Todd Shipyards, Seattle, Wash. $3,883,000. Activation of ammunition ship USS VIRGO (AE-30). Seattle. Thirteenth Naval District.

—Willamette Iron & Steel Corp., Portland, Ore. $3,784,000. Activation of ammunition ship USS CHARA (AE-31). Portland. Thirteenth Naval District.

—New York Shipbuilding Corp., Camden, N.J. $2,869,000. Activation and repair of the landing ships, tank, USS CLARKE COUNTY (LST-601) and USS COCONINO COUNTY (LST-603). Camden. Fourth Naval District.

—Bethlehem Steel Corp., Baltimore. $3,028,388. Activation and repair of the landing ships, tank, USS BULLOCH COUNTY (LST-509) and USS MEEKER COUNTY (LST-980). Baltimore. Fourth Naval District.

—Raytheon Corp., Lexington, Mass. $4,250,830. Guidance and control systems for SIDEWINDER missiles. Lowell, Mass. Bureau of Naval Weapons.

28—General Electric, Schenectady, N.Y. $1,932,950. Design and furnish support equipment for nuclear-powered ships. Schenectady. Bureau of Ships.

—Sperry Gyroscope Co., Sperry Rand Corp., Great Neck, N.Y. $11,701,999. Inertial navigation systems and associated items for use aboard Navy ships. Great Neck. Bureau of Ships.

—Stewart-Warner Corp., Chicago. $6,189,169. Radio transmitter-receivers for shipboard use. Chicago. Bureau of Ships.

—National Steel & Shipbuilding Co., San Diego, Calif. $21,492,000. Construction of a combat store ship (AFS). San Diego. Bureau of Ships.

29—Westinghouse Electric, Baltimore, Md. $2,177,280. Advanced development model of an anti-submarine warfare radar. Baltimore. Bureau of Ships.

—Westinghouse Electric, Aerospace Div., Baltimore, Md. $1,647,047. Airborne control system for F-4H PHANTOM aircraft. Baltimore. Bureau of Naval Weapons.

—Goodyear Aerospace Corp., Akron, Ohio. $4,598,061. Production unit of the A-6A Weapon System Trainer. Akron. Naval Training Device Center, Port Washington, N.Y.

30—Sperry Gyroscope Co., Syosett, N.Y. $1,587,800. Refresher maintenance training laboratories. Syosett. Navy Special Projects Office.

—Collins Radio Co., Cedar Rapids, Iowa. $10,110,325. Series of integrated electronic controls for the U.S. Navy, U.S. Air Force and the United Kingdom. Cedar Rapids. Bureau of Naval Weapons.

AIR FORCE

1—Sylvania Electric Products, Waltham, Mass. $1,206,806. Fabrication of a MINUTEMAN ground electronics system. Waltham. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—General Dynamics, San Diego, Calif. $1,168,000. Studies and evaluations applicable to anti-missile research. San Diego. Air Force Special Weapons Center (AFSC), Kirtland AFB, N.M.

2—AVCO Corp., Stratford, Conn. $11,062,122. T-53 engines for Army aircraft. Stratford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—AVCO Corp., Wilmington, Mass. $1,600,000. Design, development, fabrication, test and evaluation of MINUTEMAN MARK 11A re-entry vehicles. Wilmington. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

3—Sanders Associates, Inc., Bedford, Mass. $1,575,350. Development of aircraft ordnance fuzes. Bedford. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

6—Teledyne Industries, Garland, Tex. $1,040,000. Production of seismometers. Garland. Middletown Air Materiel Area (AFLC), Olmsted AFB, Pa.

—General Dynamics, Fort Worth, Tex. $1,950,000. Modification of the B-58 flight control system. Fort Worth. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Collins Radio Co., Dallas, Tex. $2,956,000. Airborne communications antenna systems for C-135 aircraft. Dallas. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

7—Aerodex, Inc., Miami, Fla. $6,604,139. Overhaul of R-4360 aircraft engines. Miami. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

8—AVCO Corp., Cincinnati, Ohio. $10,500,000. Equipment for early warning systems. Cincinnati. Electronic System Div. (AFSC), L. G. Hanscom Field, Mass.

—General Motors, Indianapolis, Ind. $1,682,819. Modification of C-131 aircraft. Indianapolis. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

9—Cutler-Hammer, Inc., Deer Park, N.Y. $1,057,250. Spare parts for airborne reconnaissance systems. Deer Park. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

10—Thiokol Chemical Corp., Bristol, Pa. $1,000,000. R&D of Stage I motors for MINUTEMAN Wing VI. Brigham City, Utah. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—I.B.M. Corp., Washington, D.C. $1,600,483. Electronic data processing components. Poughkeepsie, N.Y. 2750th Air Base Wing (AFLC), Wright-Patterson AFB, Ohio.

—Ford Motor Co., Newport Beach, Calif. $1,140,000. Test and evaluation of missile fuzing and arming systems. Newport Beach. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

13—Martin-Marietta, Baltimore, Md. $1,236,000. Modification of B 57 aircraft. Baltimore. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—Westinghouse Electric, Baltimore, Md. $1,858,000. Modification of search and height finder radar. Baltimore. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

14—Stewart Stevenson Services, Houston, Tex. $1,351,302. Production of electric power generators. Houston. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

15—Sylvania Electric Products, Waltham, Mass. $2,400,000. Work on ground electronics system for MINUTEMAN Wing VI. Waltham and Needham, Mass. and Buffalo, N.Y. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

16—Textron, Inc., Belmont, Calif. $1,486,361. Cable test sets and adapter assemblies. Belmont. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Sperry Rand Corp., Phoenix, Ariz. $1,188,055. Procurement of an automatic flight control system. Phoenix. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—General Electric Co., Waynesboro, Va. $1,843,884. Procurement of C 141 aircraft Electrical Systems. Waynesboro. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Sperry Rand Corp., Great Neck, N.Y. $1,814,085. Procurement of components, spare parts, aerospace ground equipment and updating kits for LORAN navigation sets. Great Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

17—I.B.M., Washington, D.C. $1,310,375. Production of electronic data processing equipment. Poughkeepsie, N.Y. 2750th Air Base Wing (AFLC), Wright-Patterson AFB, Ohio.

—Honeywell, Inc., Hopkins, Minn. $1,498,768. Aircraft ordnance. Hopkins. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Analytical Services, Inc. Falls Church, Va. $1,300,000. Analytical studies pertaining to the application of weapons systems. Falls Church. Air Force Office of Scientific Research, Washington, D.C.

—Boeing Co., Wichita, Kan. $3,150,000. Modification of B 52 aircraft flight control systems. Wichita. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

1—Federal Electric Corp., Richland, Wash. $2,007,040. MB TEEN generator sets. Richland. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

—Western Electric, New York City. $1,500,000. Engineer services for the 465L communications system. New York City. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

—F&M Systems Co., Dallas, Tex. $1,249,845. Engineering, furnishing and installing TV facilities in mobile recorder vans. Dallas. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—Lockheed Aircraft Corp., Marietta, Ga. $1,303,327,000. Development and production of the C-5A heavy transport aircraft. Marietta. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

2—Lear Siegler, Inc., Data & Controls Div., Long Island City, N.Y. $1,513,994. Production of radar equipment. Long Island City. Electronics Systems Div. (AFSC), L. G. Hanscom Field, Mass.

—General Electric Co., Re-entry Systems Dept., Philadelphia. $4,100,000. Research & development on the MARK 12 re-entry system. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—Tumpane Co., Los Angeles. $1,667,400. Performance of annual maintenance and operations services at Los Angeles Air Force Station, El Segundo. Space Systems Div. (AFSC), Los Angeles.

—Houston Fearless Corp., Los Angeles. $1,093,000. Production of photographic processing and interpretation equipment. Los Angeles. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

27—Philco Corp., Western Development Laboratories, Palo Alto, Calif. $1,000,000. Satellite control network. Palo Alto. Space Systems Div. (AFSC), Los Angeles.

Cubic Corp., San Diego, Calif. $1,731,701. Modification of geodetic survey microwave equipment. San Diego. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

28—North American Aviation, Anaheim, Calif. $1,108,000. Maintenance and repair of MINUTEMAN guidance and control equipment. Anaheim. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Aerojet-General Corp., Sacramento, Calif. $2,060,537. Maintenance and acceptance testing of TITAN II propulsion systems. Sacramento. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

Dow Chemical Co., Midland, Mich. $2,055,820. Production of aircraft ordnance. Torrance, Calif. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

AVCO Corp., Stratford, Conn. $28,283,869. Production of T 55 aircraft engines. Stratford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

29—General Electric, Philadelphia. $2,000,000. Flight testing of the Maneuvering Ballistic Re-entry Vehicle. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

RCA, Defense Electronic Products, Moorestown, N.J. $6,052,600. Depot level maintenance & supply support for instrumentation radars. Moorestown. Air Force Eastern Test Range, Patrick AFB, Fla.

Libby Welding Co., Kansas City, Mo. $2,197,103. 10 kilowatt generator sets with spare parts and related data. Kansas City. Sacramento Air Materiel Area (AFLC), McClelland AFB, Calif.

General Precision, Inc., Binghampton, N.Y. $2,567,000. F 111 mission simulators. Binghamton. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Garrett Corp., Los Angeles. $1,365,438. Spare parts to support the central air data computer on F 4 aircraft. Los Angeles. Middletown Air Materiel Area (AFLC), Olmstead AFB, Pa.

Emerson Electric Co., Electronics & Space Div., St. Louis. $2,535,000. Automatic test equipment for F 111 aircraft and MINUTEMAN missile systems. St. Louis. Middletown Air Materiel Area (AFLC), Olmstead AFB, Pa.

Cleveland Pneumatic Tool Co., Cleveland, Ohio. $1,881,230. Truck assemblies applicable to KC 135 aircraft. Cleveland. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

Honeywell, Inc., Hopkins, Minn. $4,115,992. Development of a tactical fighter munition dispenser. Hopkins. Air Proving Ground Center, Eglin AFB, Fla.

General Precision, Inc., Little Falls, N.J. $5,200,000. Components for navigational computer sets and aerospace ground equipment for C 141 aircraft. San Marcos, Calif. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

General Dynamics Corp., San Diego, Calif. $1,655,290. Design & fabrication of re-entry vehicle instrumentation and range safety systems. San Diego. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Thiokol Chemical Corp., Huntsville, Ala. $2,000,000. Solid rocket motors. Huntsville. Space Systems Div. (AFSC), Los Angeles.

From The Speakers' Rostrum

(Continued from Page 16)

be selected. Each country will get full data on the work done by the other country's contractor and the rights for production. The main difference arises with respect to royalties. We will be obligated to pay Rolls-Royce, for production for our own defense purposes, "fair and reasonable" royalties for their background work on lift engines pertinent to the engine design produced. The converse is true for Rolls-Royce's production for British defense purposes.

• Will sales be competitive? Yes, each contractor will be entitled to compete for the inventory requirements of the other country and for sales to third parties. In addition to separate bids, the two contractors can also submit joint production bids.

• Will there be "industrial compatibility?" We believe so. We know of Rolls-Royce interest in the project, to the extent that Rolls will be contributing a part of the UK share of the cost. We believe that we have provided the winning U.S. contractor and Rolls a sufficiently attractive and practicable program for them to be able to work out a mutually satisfactory commercial agreement.

Conclusion.

This has been a brief summary of what we have been doing up to now in cooperation in the development of military aircraft. In conclusion, allow me to forecast some trends that increased cooperation should bring about in the next four years:

• There will be closer working ties between the technical and military elements of our different governments.

• There will be a higher degree of integration of the aerospace industries of the several countries.

• There will be general acceptance of the business framework for development cooperation.

• And last, there will be more joint meetings of technical societies such as this one.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July-Oct. 1965	July-Oct. 1964
Procurement from All Firms	$10,133,387	$8,338,778
Procurement from Small Business Firms	2,072,309	1,686,048
Percent Small Business	20.5	20.2

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

OFFICIAL BUSINESS

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Formal Advertising Results in Increased Procurement Competition

The Department of Defense has increased competitive procurements by formal advertising from 11.9 percent of total dollars awarded in FY 1961 to 17.6 percent in FY 1965. The FY 1965 ratio for formal advertising procurements is the highest ever attained by DOD.

During the same period, DOD increased overall competitive procurements from 32.9 percent of total dollars awarded in FY 1961 to 43.4 percent in FY 1965.

A substantial part of this achievement is attributed to increased use of a procedure known as two-step formal advertising in the past several years. The percentage of formal advertising awards utilizing this method has increased from 2.4 percent in FY 1962 to 15.1 percent in FY 1965. In dollars, two-step formal advertising awards increased from $85 million in FY 1962 to $726 million in FY 1965.

Adopted in FY 1961, the two-step formal advertising procedure requires reasonable assurance of enough qualified firms interested in bidding to insure adequate price competition. In the first step, technical proposals are submitted by the bidders to determine technical competence and, in the second step, prices are submitted by qualified firms. Experience with the two-step method shows that it frequently can be used in cases where procurements otherwise would have to be negotiated.

The traditional method of advertising procurements for military supplies has been to publicize formally the intention to buy certain items and solicit offers from suppliers to sell them. Contracts are awarded by accepting the lowest prices from qualified suppliers.

The two-step procedure does not overcome all obstacles to increasing the formal advertising percentage of procurements. For example, the procurements set aside for small business firms and labor surplus areas do not lend themselves to such a procedure. Also, negotiation will continue to be required for much research and development procurement, for many complex weapons systems and in those instances where a high security classification is necessary to avoid disclosure of important development.

Nevertheless, the Defense Department will continue its efforts to increase formal advertising awards, particularly by increased use of the two-step method of advertising.

NASA Publishe[s] Aerospace Diction[ary]

A dictionary which some 7,000 technical ter[ms] being used by scientists e[...] in aerospace research an[d] opment has been publis[hed by] the National Aeronauti[cs and] Space Administration.

The new reference boo[k] signed for use by perso[ns] scientific or engineering [...] tions who are interested i[n] outside their own spe[cialties.] Each definition is intende[d] as clear as possible to t[he] expert.

Whenever possible, an [opera]tional definition is used, i[...] which defines a concept i[n terms] of actual operations by wh[ich a] defined quantity can be me[asured] rather than in terms of [...]ties. Many definitions ha[ve been] adapted from definitio[ns ac]cepted by Government ag[encies,] scientific and technical s[ocieties] and national and intern[ational] organizations.

The publication, titled [...]tionary of Technical Ter[ms for] Aerospace Use," is av[ailable] from the Superintende[nt of] Documents, U. S. Gove[rnment] Printing Office, Wash[ington,] D.C. 20402, for $3.

Readers of this first [...] are invited to submit su[g...] changes, corrections or [...]ments of definitions to i[n...] subsequent editions.

DEFENSE INDUSTRY BULLETIN

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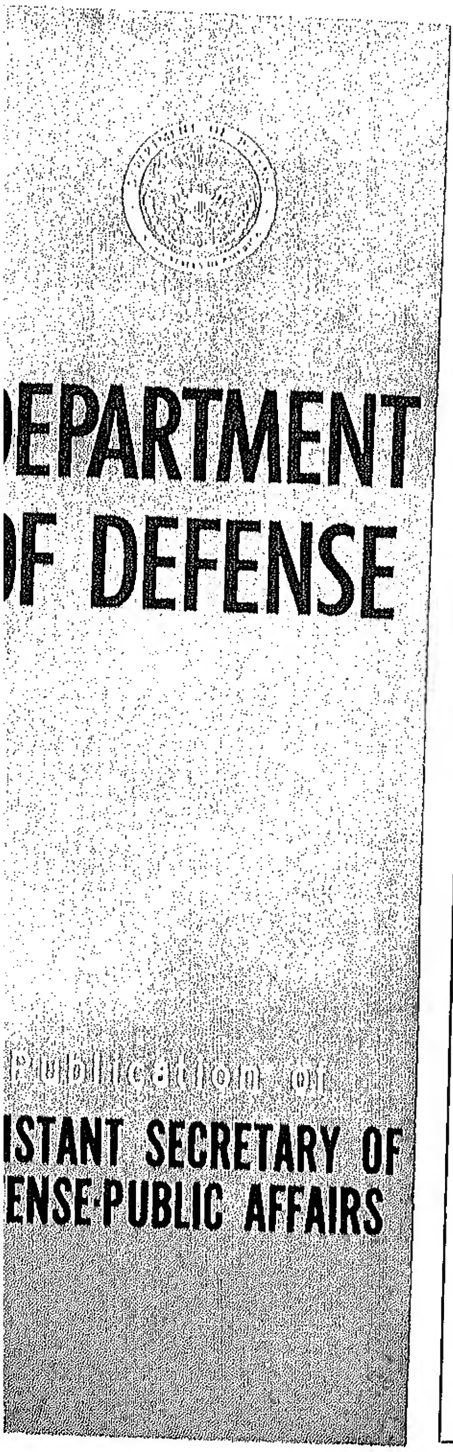
February 196[illegible]



IN THIS ISSUE

DEPARTMENTS

Vietnam Supplemental

A marine corporal soaks his swollen foot in his helmet during a break in U.S Third Marine Division operations near Da Nang. Supplemental equipment used by U.S. forces in Vietnam ranges from uniform accessories, such as this leather neck's helmet and boots, to large tanks, helicopters and other weapons. Beginning on page 1 is Secretary of Defense McNamara's statement to the Congress covering the Fiscal Year 1966 Supplemental Appropriation for Southeast Asia

Defense Department Budget Breakdown Fiscal Year 1967

In this issue of the *Defense Industry Bulletin* are featured the financial tables pertaining to the Defense budget for Fiscal Year 1967. Prepared by the Office of the Assistant Secretary of Defense (Comptroller), the tables present the FY 1967 budget in relation to budgets of recent years.

The tables appear on pages 27-36 and cover the following areas:

1. Financial Summary, FY 1961 to FY 1967.
2. Direct Budget Plan [Total Obligational Authority (TOA)], New Obligational Authority (NOA), Direct Obligations and Expenditures, FY 1965–1967.
3. Direct Budget Plan (TOA), New Obligational Authority, Direct Obligations and Expenditures, FY 1967—By Functional Title and Service.
4. Procurement, FY 1965–1967.
5. Research, Development, Test and Evaluation, FY 1965–1967.
6. Estimated Obligations and Amounts Available for Obligation, General Fund Appropriations, FY 1965–1967.
7. Estimated Expenditures and Amounts Available for Expenditure, FY 1965–1967.
8. Order of Magnitude Data on Comparative New Obligational Authority by Functional Title as if FY 1967 Budget Structure Had Been Adopted Circa 1948.
9. Order of Magnitude Data on Comparative Expenditures by Functional Title as if FY 1967 Budget Structure Had Been Adopted Circa 1948.
10. Estimated Expenditures for Vietnamese Support, FY 1966 and 1967.

Reliable Redstone Missile Reactivated for Project Defender

A modified version of the Army's famed Redstone missile, brought out of retirement last June, has been launched successfully from the Pacific Missile Range, Point Mugu, Calif. The successful launch, which took place after nearly two months of exposure to severe storms and salt spray from the Pacific Ocean, demonstrated anew how the rocket got its nickname, "Old Reliable."

The missile was one of several Redstones reactivated by Chrysler Corporation's Missile Division under contract to the U. S. Army Missile Command. The modification and launch program is sponsored by the Advanced Research Projects Agency (ARPA) as part of Project Defender, a series of investigations in ballistic missile defense.

Redstone was selected for use in Project Defender because of its proven reliability, mobility and flexibility which permits adaption to the ARPA mission with a minimum cost and reaction time. The missile has chalked up an overall performance record of 95 percent successful flights.

The Army Missile Command is managing the Redstone launch program for ARPA, an agency of the Defense Department.

DEFENSE INDUSTRY BULLETIN

Published by the Department of Defense

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Secretary of Defense

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Deputy Secretary of Defense

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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Supplemental Budget for Southeast Asia

Excerpts from statement of Secretary of Defense Robert S. McNamara before a joint session of the Senate Armed Services Committee and the Senate Subcommittee on Department of Defense Appropriations on the Fiscal Year 1966 Supplemental for Southeast Asia.

When I appeared before this Committee last August with the Amendment to the FY 1966 Defense Budget, I described to you the actions we were taking to carry out the President's decision to deploy a force of 125,000 U.S. military personnel in South Vietnam and to be prepared to deploy still more forces if that should become necessary. I noted at the time that if we were to maintain our capabilities to deal with crises elsewhere in the world, these deployments would require some increases in forces, personnel, operating rates, production rates and construction of facilities above the levels provided in our original FY 1966 budget.

Because we had not had time to work out detailed personnel plans and to calculate on a phased basis the increases in activity rates, the movements of troops and materiel and the other operation and maintenance costs associated with the build-up in Southeast Asia, we proposed to finance the additional military personnel and O&M costs under Section 612 of the FY 1966 Defense Appropriation Act. Similarly, because we had not had time to develop detailed estimates of production and construction plans for the additional materiel and facilities required, we proposed, and the Congress appropriated, an additional $1.7 billion in a separate account, "Emergency Fund, Southeast Asia." This appropriation was intended to provide for the additional financing needed through early 1966 to gear up the production machine—accelerate the delivery of essential items already in production, initiate production of new items required for the support of our forces in Southeast Asia—and construct the most urgently needed facilities.

I said at the time that when we appeared here this January, we would have a much more precise estimate of the additional requirements and our financial needs for the balance of FY 1966. These estimates are now available, and total $12,345,719,000 in new obligational authority.

Inclusion of Certain Military Assistance Support in the Defense Budget.

Included in our supplemental request for FY 1966 is about $200 million for the support of South Vietnam's armed forces and other free world military assistance forces engaged in that country. These requirements have heretofore been financed in the Military Assistance Program. However, now that large U.S. and other free world military assistance forces (e.g., Korean) have joined in the defense of South Vietnam, the maintenance of separate financial and logistic systems for U.S. and military assistance forces is proving to be entirely too cumbersome, time-consuming and inefficient. The same problem was encountered at the outset of the Korean War. It was solved, then, by programming, budgeting and funding for all requirements under the "military functions" appropriations and providing a consolidated financial and supply system for the support of U.S., Korean and other friendly forces engaged in that effort. This arrangement gave the field commanders maximum flexibility in the allocation of available resources and improved the support of the forces employed. We are proposing essentially the same solution for the problems now being encountered in South Vietnam.

Under the proposed arrangement, all unexpended balances of FY 1966 and prior year military assistance funds for South Vietnam would be transferred to and merged with the accounts of the Military Departments; and all additional funds required for the support of the forces of South Vietnam and other free world military assistance forces in that country would be authorized for and appropriated to the accounts of the Military Departments. The remainder of the Military Assistance Program would be legislated separately.

Further Force Augmentations and Related Personnel Increases.

If we are to be prepared to deploy additional forces to Southeast Asia, some further augmentations of our forces and personnel strengths are required. The increases in forces and personnel now proposed are summarized in Table 1 (tables referred to start on page 37). The first column shows the personnel increases approved in August 1965 and the second column the increases as revised in January 1966. A number of these changes require some explanation.

In the Army, the major change since last August is in the number of additional military personnel required for the support forces. Inasmuch as it appears desirable to be in position to deploy additional forces without calling up reserves, these support units must be provided in the active force structure. In addition to that change, we have also added another increment of Army aviation companies to the number approved in August.

The major increase in the Marine Corps over last August is an additional division force, together with a number of tactical helicopter squadrons, observation squadrons and an air support control unit.

In the Navy, we have added to the forces approved in August: 11 LST's and one refrigerator stores ship for logistic support; more SWIFT boats and a mother ship to augment our coastal patrol activities; a number of river control boats and yard craft; and one destroyer. We have also augmented the Navy construction battalions in the Pacific area and are adding four new construction battalions to the Navy structure.

The increases in the Air Force are related to the retention of B-57 and F-102 aircraft previously scheduled to be phased out, a major expansion in the rotation and training base and the logistic support required for the forces in Vietnam.

As shown on the bottom of Table 1, a total of about 510,000 military personnel will be required to man the additional forces and support the increased training, rotation and logistic base. Other adjustments in forces and activities will add another 17,000, but our decision to substitute some 58,000 civilian for 74,000 military personnel spaces will reduce the net

increase over the original end of FY 1966 military personnel strength to about 453,000, and 113,000 more than the increase approved last August. . .

Table 2 provides a recapitulation of the proposed personnel increases, including those related to Southeast Asia. The second column shows the additional personnel required for the support of the Southeast Asia effort over and above the numbers provided in the original FY 1966 Budget as shown in column one. The third column shows the adjustments resulting from the substitution of civilians for military personnel. The fourth column shows other adjustments (pluses and minuses) related to productivity savings, non-Southeast Asia related force changes, etc. The fifth column shows the net additions to the original end FY 1966 strengths. The next column shows the number scheduled to be on hand at end FY 1966 and the last column the balance to be added thereafter.

Additional FY 1966 Requirements for Procurements, RDT&E and Construction.

Table 3 shows the additional funds required for the balance of the current fiscal year for procurement, for research, development, test and evaluation and for military construction in support of our combat operations in Southeast Asia. Of the $1.7 billion added to the FY 1966 Budget last August, about $1,534 million was applied to procurement, particularly for long lead time components, new production equipment, tooling and all the actions necessary to accelerate production rates—but not actually to finance these higher production rates beyond about February 1966. That is the purpose of the additional $7 billion which we are now requesting for procurement in this FY 1966 Supplemental for Southeast Asia.

The balance of the $1.7 billion added to the FY 1966 Defense Budget last August, about $166 million, was used to finance (through February 1966) the most urgent construction projects needed for the support of our military operations in Southeast Asia. The additional $1,238 million included in the Supplemental will complete the financing of the FY 1966 increment of that construction program.

In preparing the estimates of our financial requirements for the balance of FY 1966, we have assumed, for budgeting purposes, that combat operations will continue through the end of June 1967; thus the entire requirement for the longer lead time items through that date is included in this Supplemental.

Ammunition.

As shown on Table 3, about $2.1 billion is included in the FY 1966 Supplemental for ammunition which, together with the approximately $1.1 billion included in the original FY 1966 Budget and $800 million from the August Amendment, gives us a total of about $4.1 billion for FY 1966. This is, admittedly, a very high figure; but our operational plans call for a massive application of firepower to enhance the effectiveness of our forces and reduce casualties.

We estimate that our ground forces (including associated helicopter units) are now consuming ammunition at the rate of about $100 million per month, and we are budgeting for a consumption rate considerably higher. . . .

With regard to air munitions, we are now consuming at a rate of about $110 million per month; and we are preparing to support a much higher rate. . . .

Aircraft.

Although the aircraft loss rate continues low, the rapidly increasing number of sorties is resulting in larger total losses. . . . A total of about $1.8 billion for the replacement of aircraft losses is included in the FY 1966 Supplemental. Another $168 million is included for the Army to equip new aviation units.

The considerably higher rates of utilization of many types of aircraft in all the Services will also increase the consumption of spares. . . . Accordingly, we have included in the FY 1966 Supplemental about $1.2 billion for aircraft spares and other aircraft equipment for all the Services.

Other Materiel.

The additional funds requested for vehicles, electronics and communications and other procurements are mostly to equip new units, notably the additional Army and Marine Corps divisions, and for logistic and training support as well as to equip the new facilities being built in Southeast Asia.

Increases in Production Rates.

To support these higher rates of consumption and combat attrition, rebuild inventories and provide for the additional forces, we have greatly increased production rates and started new production lines. Planned production rates of the principal types of helicopters used in Vietnam have been just about tripled and certain fixed-wing types just about doubled. Production rates of the principal munition items have been increased many fold and major increases have been made in the production of tropical uniforms and jungle boots.

Research, Development, Test and Evaluation.

The $152 million included in the FY 1966 Supplemental for RDT&E is to accelerate certain development projects of particular interest to our operations in Southeast Asia. You may recall that one of the items included in our first set of amendments to the FY 1962 budget was the sum of $122 million for research and development of non-nuclear weapons and equipment specifically designed for limited wars and counterinsurgency operations. Since that time, we have vigorously pursued our efforts in that area and many of the new weapons, equipment and techniques now being employed in Vietnam came out of this work, e.g., the armed helicopter, jungle communications equipment, battlefield radars, defoliation agents, emergency airfield equipment, lightweight body armor, minigun armed aircraft, ammunition for M-79 grenade launchers, jungle boots, etc.

Many other items of this type are now well along in development. In order to make them available for use in Vietnam at the earliest possible time, we have undertaken a new effort called Project PROVOST (Priority Research and Development Objectives for Vietnam Operations Support), designed to identify those current R&D projects which could make a significant contribution to our military operations in Vietnam, and which, with additional funds, could be brought to fruition relatively quickly. So far the Military Departments have identified over 150 items of this type, and we have already utilized about $58 million from the FY 1966 R&D Emergency Fund for their support. We are now requesting an additional $152 million for FY 1966 to continue and expand this effort and to meet other urgent requirements. Among the items to be supported with these additional funds are the development of a therapeutic

(Continued on Page 37)

Total Package Concept

by

Maj. Gen. Charles H. Terhune, Jr., USAF

When Lockheed Aircraft Corporation was selected as the supplier to build the Air Force's C–5A cargo plane for almost $2 billion, it marked a major step toward the implementation of a new purchasing concept likely to influence the future pattern of acquisition of most major weapons systems.

The C–5A will be a massive jet aircraft capable of transporting the heaviest battle equipment on intercontinental missions. Twice the size of the largest existing carrier, the C–5A will weigh more than 350 tons and will carry 100 tons of cargo better than 2,700 nautical miles at a fraction of the ton-mile costs of existing air transports.

To bring the giant plane into being, the Air Force is making its first employment of the Total Package Concept (TPC) of system acquisition. The concept is so new, of such magnitude and of such importance to contractors, suppliers and taxpayers that the functioning of the concept has continued to vie in interest with the challenge and excitement of the plane itself.

Heretofore, Air Force purchases of complex equipment and systems customarily involved separate contract actions for research and development, production, associated aerospace ground equipment, training devices and spare parts for maintenance. This previous method of system acquisition caused a major area of general concern.

A de facto pattern emerged in which the element of competition too often was limited to the research and development phases. By the time a system advanced to the production stage, the Air Force was frequently faced with one choice: the company which had done the earlier work was the sole source of production. By comparison, the TPC offers a means for extending the competitive umbrella to a major portion of the total program requirements as well as covering the design, development and test effort.

There is a long jump between learning how to make a radical change in the purchasing technique and determining whether and when that change should be made. These facets caused considerable concern among everyone directly involved. Being custodian and overseer of billions of dollars of the taxpayers' money is a serious responsibility in itself. In addition, there is the haunting suspicion that totally unforeseen trouble zones might cost too much in the long run, or even adversely affect the quality and supply of needed equipment to the operating commands.

The old, established contracting procedures had survived the test of experience. Although they had weaknesses, they produced the goods. We knew they worked. The TPC, while having very desirable aspects, was an untested theory. Consequently, as the commander charged with the job, I felt that the theory had to be subjected to a step-by-step analysis by the most experienced minds available in order to provide assurance as to the practicality of the new procedures.

Therefore, we formed a group of some 20 specialists (from fields of procurement, management, production, etc.) and charged them to make a detailed, critical analysis of all facets of the proposed method of acquisition. Some 32 areas were identified and intensively examined for potential problems. A great number of skilled man-hours went into this conceptual review. And then, with the resultant report and suggestions, decisions were made as to the manner of applying the Total Package Concept to the procurement of the C–5A.

Maj. Gen. Charles H. Terhune, Jr., USAF, is Commander of the Aeronautical Systems Div., Air Force System Command, located at Wright-Patterson AFB, Ohio. Prior to his present assignment, he commanded AFSC's Electronic Systems Div. and, from 1954 to 1959, served as Dep. Commander for Ballistic Missiles of the Air Force Ballistic Missiles Div.

The implications of that action may be far-reaching. Total results have yet to be proved but, in my opinion, the Total Package Concept and its derivatives could apply to most weapon and support system procurements in the future.

The TPC aims at one fixed-price-incentive contract to cover development, testing, production of the major portion of the operational requirement and most of the required logistic support, including aerospace ground equipment and the pricing of spare parts and contract technical services. All terms and conditions of the contract, including price, are agreed upon at the outset, immediately after completion of contract definition, but before the selection of a source for the development production contract and while the matter still rests in a competitive environment.

In the case of the C–5A, Boeing, Douglas and Lockheed competed for the airframe contract while General Electric and Pratt and Whitney vied for the engine contract. Final award went to the competitor whose technical and price proposals were considered to provide the greatest overall value throughout an estimated 10 years of operation. We anticipate that this application of the TPC will allow the Air Force to realize significantly lower costs and better operational performance.

The impact on the contractor is considerable: it minimizes "buy-in" bidding on the development contract with its attendant problems of understated costs, overstated performance characteristics and unrealistic delivery schedules. Additionally—and future experience with C–5A will test this thesis—the TPC could prove a catalyst that will encourage simplicity of production design during development, a time when relatively small effort can result in large efficiencies during subsequent production. This will mean reduced costs to the taxpayer and increased profits to the contractor.

Finally, TPC will require the contractor to obtain supplies and services from the most efficient source. It will encourage competitive outside

procurement and it will provide fresh opportunities for efficient suppliers, large or small. In this environment there can be no substitute for quality. Nor can the contractor display other than the highest type of integrity. He and his associates and the Government will have a lot of eggs in one basket.

Incentives built into the Total Package Concept affect not only the cost but also the delivery and performance of the end item. This control is generated by certain peculiarities of the contract terms and conditions. Some examples:

• Correction of deficiencies. The contractor is held responsible for correcting any deficiencies in the material furnished at no charge in total target cost, target profit, or contract ceiling price for six months after Category II testing is complete, or six months after delivery of each aircraft thereafter.

• Control of changes. Changes in the C–5A with an individual cost of less than $100,000 will be accomplished at no change in contract targets or ceiling. Those over $100,000, but less than one percent of the initial total contract target costs, will normally be negotiated at appropriate increases in target cost, target profit and contract ceiling price so long as the cumulative effect of such changes is less than three percent of the initial total contract target cost. Thereafter, with certain exceptions, the profit allowed for any approved changes will not exceed two percent of the agreed target cost.

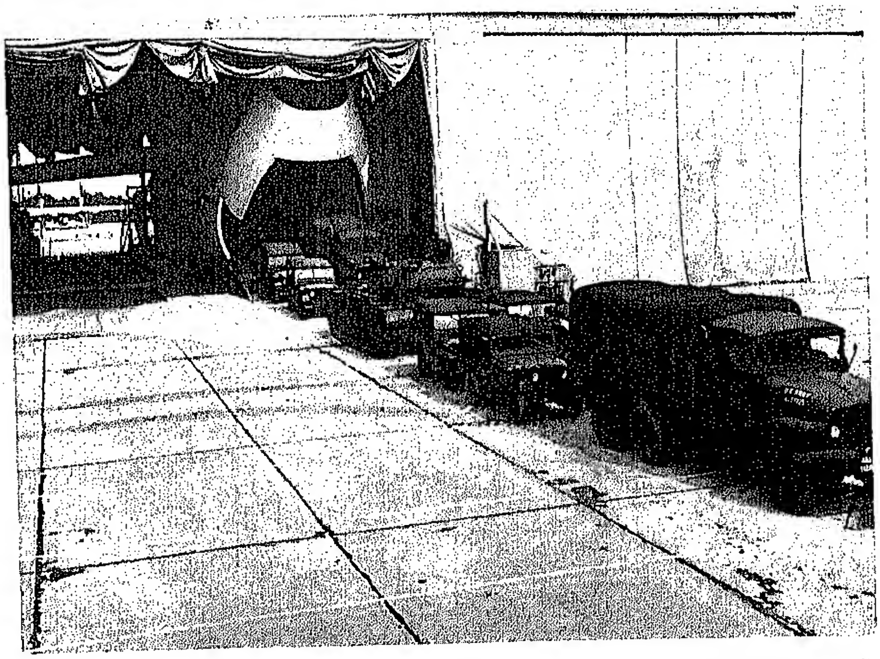
• System responsibility. The contractor has overall responsibility for the performance of the total system, including all contractor furnished equipment and all the integration and performance of the engine subsystem which is Government furnished. (The engine contractor, of course, will be responsible for producing and delivering engines and related equipment in conformance with specifications and other contractural requirements.) In the C–5A procurement, the airframe and engine competitors entered into contracts which spelled out the responsibilities of each and the conditions for sharing risks and rewards.

• Progress payments. Because the magnitude of the task and expenditures involved before the first deliveries will be made, the contractor for the C–5A will receive 90 percent progress payment during the initial stages of the program instead of the customary 70 percent. Later, the rate of progress payment will revert to 70 percent.

• Fluctuations of economy. The possibility of significant inflationary or deflationary economic trends is a recognized risk in long term contracts. Therefore, the C–5A engine contract includes a provision to revise target cost and ceiling price, beginning three years after the award, to reflect abnormal fluctuations by the economy. The airframe contractor elected to omit this provision.

• Labor law changes. Another provision exists for equitable adjustment in target cost, target price and ceiling price if Federal laws governing work conditions, wages and fringe benefits cause abnormal changes in labor costs or labor overhead.

Despite limited experience to date in the application of TPC, I am quite confident it will grow in prominence as a means for system acquisition. At each milestone along the way, the concept will come under renewed scrutiny to determine how well it lives up to expectations and what adjustments need to be made to achieve our mutual goals. However, even at this stage, it is clear that the benefits and features of TPC offer great potential for both industry and Government.



Caravan of military vehicles unloads from a mock-up to the planned U. S. Air Force C-5A transport aircraft.

AF Buys New Long Tank Thor Space Boosters

The Air Force Systems Command will purchase 21 newly designed long tank Thor space boosters to meet more difficult launch requirements.

The new version, which will have a greater payload capability than previous models, will be unveiled for the first time next summer.

Developed on the "building block" concept, which provides for graduated expansion of the Thor's capability, the long tank version offers added payload capability by increasing the volume of liquid propellant tanks.

The liquid oxygen tank has been extended and the conical upper section of the booster has been changed to a straight cylinder of the same diameter as the rest of the airframe. These features permit a longer burn time for the main engine, making it possible for the long tank Thor to hurl 20 percent heavier payloads into space than the present thrust-augmented Thor.

Although the total thrust of 330,000 pounds is essentially the same as that for the thrust augmented conical configuration, the long tank Thor attains its increased payload capability with a 216-second burn time compared to 146 seconds for the thrust-augmented Thor.

Combined with various upper stages, the long tank Thor is expected to shoulder the majority of the Air Force's space programs at Vandenberg AFB, Calif.

The FDL Ship Project

by
RAdm. Nathan Sonenshein, USN
Program Dir., FDL Ship Projects
Bureau of Ships

Three thrusts, or streams of effort, intersect in the Fast Deployment Logistics (FDL) Ship Project.

First, the development of a seaborne system for rapid deployment of U.S. forces.

Second, the trial application of contract definition processes for ships.

Third, the trial application of the "total package" approach for ship procurement.

Let me discuss briefly each of these efforts, starting with a summary of the development of rapid deployment concepts. In response to the Secretary of Defense's interest in developing efficient methods for basing U.S. ground forces on this continent and deploying them rapidly to overseas areas, in 1964 the Navy initiated concept studies on the Logistic Support of Land Forces, commonly known as LOGLAND. Increased flexibility and speed of response, reduction in total cost and improvements in the international balance of payments were obvious objectives.

LOGLAND became the wellspring of the FDL when it developed that ship systems could play a vital and effective role in the deployment of ground forces, especially their heavy equipment. Thus evolved the concept of large fast ships with both rapid cargo handling capabilities and embarked lighterage and helicopters for over-the-beach unloading in the absence of port facilities.

A versatile system was envisioned: in one possible mode of operation, these ships would be loaded with ground force divisional equipment maintained in a ready-to-roll condition. With FDL ships strategically deployed, airlifted troops would rendezvous and marry up with the heavy equipment on short notice. Thus, in the rapid deployment of ground force equipment, the FDL's would complement the C-5A's and other airlift aircraft.

The second major stream of effort in this project is to apply the contract definition process to ships. This approach has been successfully applied in the development of numerous weapon and aircraft systems; the FDL application represents a "first" for ships, and adaptation and refinement of the process may be necessary. To assist those who are not acquainted with DOD terminology, a few definitions may be in order:

• **Concept Formulation** describes the activities preceding a decision to carry out engineering development. These activities include comprehensive system studies and experimental hardware effort under exploratory and advanced development and are a prerequisite to carrying out engineering development.

• **Contract Definition**, until recently referred to as Project Definition Phase, is that phase during which preliminary design and equipment are verified for accomplishment and firm contract and management planning are performed.

The total package approach to ship procurement is the third major thrust of the FDL program. In this project, the total package will consist of four major elements:

• Ship Design and Development.

• Facilities Plan.

• Ship Construction (Multi-year, Series Production).

• Ship Performance.

Emphasis is placed not only on the initial acquisition cost of ships, but on the entire package as well—from design, through facilities improvement for construction, ship production by series production and, finally, to reliability, maintainability, maintenance, operating cost, correction of deficiencies and guarantees or warranties of cost and performance for a selected number of years after delivery. Heavy emphasis will, therefore, be placed on design work study, value engineering, shipyard automation, minimum maintenance, preservation methods and and other techniques for reducing the maintenance and operating costs of ships, which greatly exceed their initial acquisition costs. For example, a new class of Navy reefer ships, designated AFS and now being delivered to the Fleet, will have an estimated 20-year maintenance and operating cost of $63 million while their initial construction cost is only $27 million.

With these new procurement concepts, we expect to attain:

• Added impetus to the modernization of shipbuilding techniques and facilities.

• Lower average cost of ships.

• Increased standardization of ships.

• Increased industry input into Naval ship design and construction.

The anticipated additional impetus for the modernization of private shipbuilding techniques and facilities is an important consideration in this concept. Sweden's Arendal Yard is a prime example of a modernized shipyard. This yard was placed into service in mid-1963 in Gotaverken, Sweden, and represents, in my opinion,

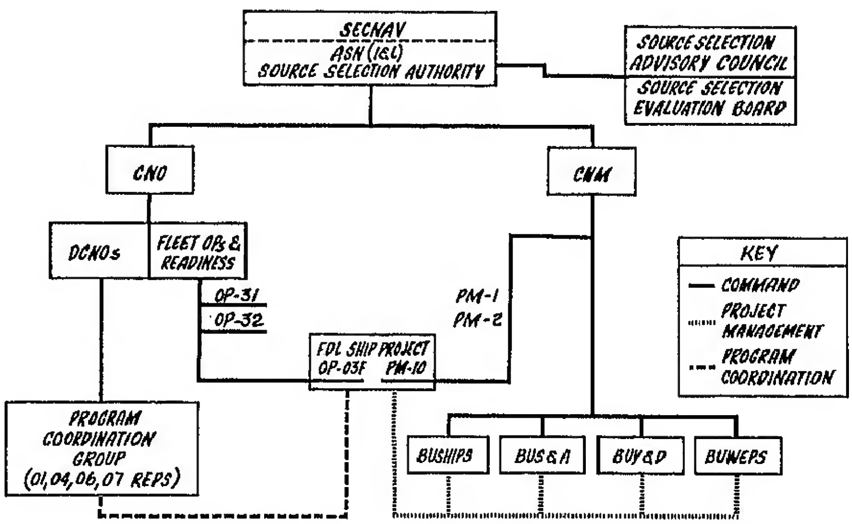


Figure I.

the most advanced shipyard in the world for the production of commercial type ships. It is producing 70,000 dead-weight-ton tankers at 40 percent of the man-hours used in producing similar ships at its parent conventional shipyard five miles distant. It emphasizes a steady, straight line flow of material by mechanical conveyors from the plate yard, through fabricating stations, to a major assembly shed and intense application of the most modern methods of production control. In the assembly shed, subassemblies up to 300 tons in weight are placed on building ways and large hydraulic jacks literally extrude the partially assembled ship into the building docks as each successive section is added. Methods such as these are permitting this yard, whose wage rates are more than twice as great as those in Japan, to deliver ships competitively priced with those produced in Japan. Those ships are delivered in 20 weeks from start to trials after a seven-week erection period.

In sharp contrast to this exciting advance in shipbuilding facilities in Sweden, which is paralleled by similar progress in Japan and other European countries, there has not been a major shipyard constructed in the United States since the end of World War II; and facilities improvements in private yards have been, with a few notable exceptions, only minor. It is our expectation that application of the total package approach on a multi-year basis, permitting series production of a substantial number of ships, will encourage and permit the construction of new, or the modernization of old, facilities to equal or better the productivity being attained in yards such as Arendal. In fact, it is our belief that the offerors will find it advantageous to use such approaches, and our studies indicate that the cost of such improvements could be amortized in the kind of project we are planning.

Our expectation to achieve the second point—lower average cost of ships—is founded again on the fact that we contemplate constructing a large number of ships in series and, thereby, taking full advantage of the phenomenon known as the progressive curve. Various mathematical formulations have been developed to express the relationship that has been observed in series production. In general, they say that, as the total quantity of units produced doubles, the cost per unit declines by some constant percentage. Thus, if we speak of a progress curve with a slope of 85 percent, we mean that as the number of units produced is doubled, unit costs are decreased by 15 percent. Analytical studies comparing various quantities of ships show that significant gains in cost and time can be accomplished through series production and modernization. During World War II, the first five Victory ships built in a yard required an average of 1,100 man-hours per ship. In that yard, the number of man-hours dropped to 711 when about 30 of these same ships were constructed in series.

Increased standardization of ships is the third expected result of the new procurement concepts. From the point of view of the Fleet, which has to operate Navy ships, this is probably the most important attribute because it impinges directly on the logistic support of ships and the training of men to operate equipment in the ships. Lack of standardization is one of the least desirable by-products of our present method of ship procurement. Of about 180,000 hull, machinery and electrical components controlled through the Ship's Parts Control Center in Mechanicsburg, Pa., 22 percent have only one application in the Fleet. Series production of all the FDL ships in one shipyard should provide a direct route to essentially complete standardization.

Finally, the new procurement concepts will also increase industry input into naval ship design and construction. There are currently in the United States over 300 private shipyards capable of construction and repair of ships, and there are some three dozen private design agents. By way of definition, I should say that preliminary design, contract design and detailed construction design are three steps of increased refinement in the preparation of USN ship designs. Very few shipyards have organic design capabilities beyond preparation of construction plans, but depend instead on design agents for preparation of preliminary and contract design. Only 78 shipyards can handle ships over 400 feet in length and about 16 design agents have been dealing actively in recent years with the Navy Department in connection with its shipbuilding programs.

Of these 94 concerns (78 plus 16), very few have preliminary and contract design capability. The lack of ship design, system management, or operational analysis capability among shipyards is a result of existing ship procurement practices; however, it need not be a bar to attaining such capability either by contract or by direct hire. In fact, this method of obtaining such support is now common practice in the shipbuilding industry in this country. Incidentally, it is not our intention to require recompe-

(Continued on Page 32)

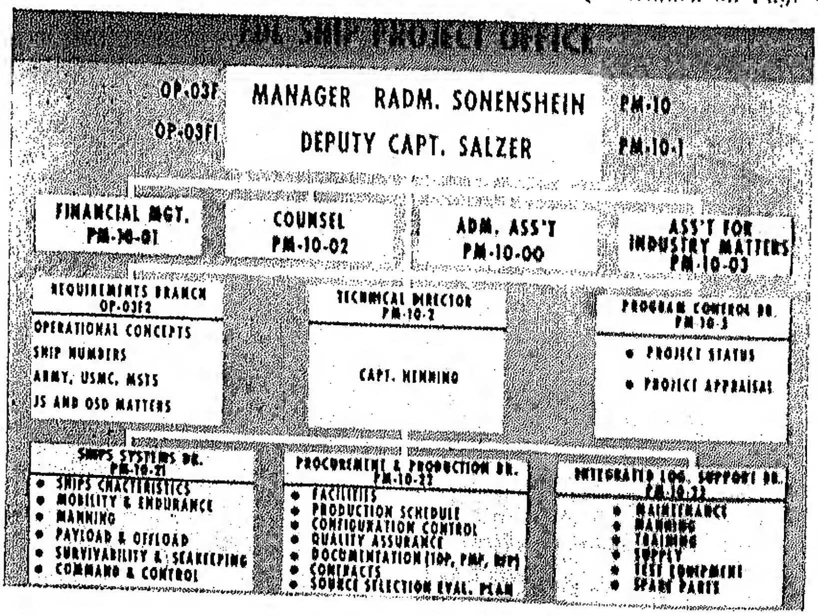


Figure II.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Lt. Gen. James B. Lampert, USA, was designated principal Dep. Assistant Secretary of Defense (Manpower), effective Jan. 7. Mr. Roy K. Davenport was designated Dep. Asst. Secretary of Defense (Manpower) for Planning and Research, effective Jan. 2.

Col. Ben W. Legare, USA, has been assigned to the Office of the Asst. Secretary of Defense (Public Affairs). He will be relieved as Information Officer, Military Assistance Command, Vietnam, in February by Col. Rodger R. Bankson, USA. Col. Bankson has served as Special Asst. for Vietnam in OASD (PA) since June 1964.

Col. Fred H. Sitler, USAF, has been assigned as Commander, Defense Industrial Plant Equipment Center (DIPEC), Memphis, Tenn. He has been serving as acting commander since November following the retirement of Col. Samuel F. Langley, USAF.

Col. Bert S. Harris, USAF, is now serving as Chief of the Technical Test and Evaluation Div., Defense Communications Agency.

Lt. Col. Herbert D. Clark, USA, has replaced Lt. Col. Jesse G. Hill, USAF, who retired Nov. 30, as Executive Officer, Defense Documentation Center of the Defense Supply Agency.

DEPARTMENT OF THE ARMY

Dr. Jay Tol Thomas has been appointed Dir. of Research and Laboratories, U. S. Army Materiel Command (AMC) headquarters, Washington, D.C. He will be the first to fill the newly created position.

Lt. Gen. John L. Throckmorton has succeeded Lt. Gen. W. H. S. Wright as Chief, Office Reserve Components. Gen. Throckmorton has been Dep. Commander, Military Assistance Command, Vietnam, since July 1964.

Lt. Gen. James H. Polk has been reassigned to succeed Lt. Gen. Theodore J. Conway, as Asst. Chief of Staff for Force Development, U. S. Army. Gen. Conway will assume command of the Seventh U.S. Army, Europe.

Brig. Gen. Lloyd B. Ramsey has been selected to fill the post of Dep. Chief of Information. He will assume his new duties March 1. Gen. Ramsey served as Dep. Commanding General, U.S. Army Training Center (Engineer), Fort Leonard Wood, Mo., prior to being selected for his new assignment.

Col. Raymond S. Crossman has been appointed Project Manager for the 2.75" folding fin aircraft rocket at Hq., U.S. Army Materiel Command, Washington, D.C.

Col. Arthur B. White has been appointed Chief, Technical and Industrial Liaison Office, Office of the Chief of Research and Development, U.S. Army.

Lt. Col. F. J. Dirkes has relieved Col. Paul W. Ramee as District Engineer for the Army Corps of Engineers at Savannah, Ga.

Col. Edmund Kirby-Smith has become Dep. Div. Engineer, South Atlantic Div., Army Corps of Engineers, Atlanta, Ga., succeeding Col. John C. Potter, Jr.

Col. Harry F. Cameron, Jr., has been named Mediterranean Div. Engineer for the Army Corps of Engineers, with headquarters in Leghorn, Italy. He takes over the position in March.

Maj. William A. Cole is serving as Acting Project Manager of the Sergeant Weapon System, Army Missile Command, Huntsville, Ala. He replaced Col. J. Mort Loomis, Jr., who retired Dec. 31.

Brig. Gen. Keith L. Ware, 50, has become Chief of the Army's Office of Information relieving Maj. Gen. George V. Underwood, Jr., Feb. 1.

The new Chief of Information, the thirteenth to serve in the position since it was created in January 1946, has also been selected for promotion to major general.

Gen. Ware has been Deputy Chief of Information since September 1963. Before coming to the Pentagon for duty he served as Assistant Division Commander, Second Armored Div., Fort Hood, Tex.

The new Army Information Chief was commissioned July 18, 1942, and served in Europe during World War II. He is a holder of the Congressional Medal of Honor, Silver Star and Bronze Star.

DEPARTMENT OF THE NAVY

RAdm. William M. Heaman has moved ahead from duty as Dep. Dir., Pacific Div., Bureau of Yards and Docks, to the position of Dir., vacated by RAdm. James R. Davis, who retired Feb. 1.

RAdm. William F. Petrovic has taken the helm as Commander, U.S. Naval Shipyard, Brooklyn, N.Y., from RAdm. John H. McQuilkin.

The U.S. Marine Corps has a new Dir. of Information. He is Col. Paul M. Moriarty. The outgoing director, Brig. Gen. Arthur H. Adams, has been reassigned as Commanding General, Marine Air Reserve Training Command, Glenview, Ill.

The following Marine Corps officers were advanced to the rank of brigadier general in January: Brig. Gen. Earl E. Anderson, Brig. Gen. Clifford B. Drake, Brig. Gen. Michael P. Ryan and Brig. Gen. Frank E. Garretson.

DEPARTMENT OF THE AIR FORCE

Brig. Gen. Hugh B. Manson has been named to succeed the late Maj. Gen. Irving L. Branch as Commander, Air Force Flight Test Center, Edwards AFB, Calif. Gen. Branch was killed in January when the plane he was flying in crashed into Puget Sound near Seattle.

Brig. Gen. Charles G. Chandler, Jr., Dir. of Maintenance Engineering in the Office, Dep. Chief of Staff, Systems and Logistics, has been reassigned as Dir. of Materiel, Pacific Air Force.

The new Chief of Electronic Systems Division's Electronic Data Processing Equipment Office is Col. S. P. Steffes. He replaces retired Col. Edward McCloy.

Col. Leonard W. Lilley has succeeded Col. William J. McGinty as Dir. of Information for the Air Force Systems Command at Andrews AFB, Md. Col. McGinty is now serving in South Vietnam as Dir. of Information for the 2nd Air Division.

Col. Joseph E. Andres has been named to replace Col. George C. Hozier as Dep. for Subsystems and Equipment Management at Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio. Col Hozier will retire from the Air Force on being relieved.

Col. Maurice R. Reilly has been ordered to Headquarters, Air Force Systems Command, Andrews AFB, Md., where he will serve as Dep. Dir. of Communications Electronics.

Col. George B. Munroe, Jr., has been assigned to the Office of the Dep. Chief of Staff (Research and Development) as Asst. for Foreign Development.

CALENDAR OF EVENTS

March 3-4: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Boston, Mass.

March 3-4: Third Annual Southeastern Symposium on Government Contracts, New York City.

March 9-10: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Atlanta, Ga.

March 16-17: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, St. Louis, Mo.

March 21-24: Institute of Electrical & Electronics Engineers Exposition, New York City.

March 22-31: American Chemical Society Meeting, Pittsburgh, Pa.

March 24: Thirteenth James Forrestal Memorial Award Dinner, Washington, D.C.

March 27-April 2: American Society of Photogrammetry Meeting, Washington, D.C.

April 5-6: Armed Forces Communications Electronics Assn.-U.S. Army Electronics Command Symposium, Fort Monmouth, N.J.

April 11-15: Institute of Environmental Sciences Meeting, San Diego, Calif.

April 12-13: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, San Francisco, Calif.

April 18-21: Aerospace Medical Assn. Meeting, Las Vegas, Nev.

April 18-22: American Geophysical Union Meeting, Washington, D.C.

April 18-22: American Society of Tool and Manufacturing Engineers Meeting, San Francisco, Calif.

April 24-28: American Society of Mechanical Engineers Meeting, Kansas City, Mo.

April 27-28: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Washington, D.C.

May 1-4: American Institute of Chemical Engineers Meeting, Columbus, Ohio.

May 1-4: National Association of Electrical Distributors Meeting, Miami Beach, Fla.

May 1-5: American Society for Microbiology Meeting, Los Angeles, Calif.

May 3-5: American Society of Lubrication Engineers Meeting, Pittsburgh, Pa.

May 9-11: National Aerospace Electronics Conference, Dayton, Ohio.

May 10-12: National Tele Conference, Boston, Mass.

May 11-13: American Helicop ety Meeting, Washington, I

May 16-20: American Society Engineers Meeting, Denver

May 31-June 2: American So Quality Control Meeting, N City.

AFA National Conve Slated for March 22

The Twentieth Anniversa the U. S. Air Force combat mands Tactical Air Com Strategic Air Command an Defense Command will l luted at the Air Force As tion national conventio Dallas-Fort Worth, Tex., l 22-25.

Highlighting the conve will be major policy add by Secretary of the Air Harold Brown and Air Chief of Staff General J. l Connell.

Seminars and symposiu key aerospace issues will b during the convention a large air show will be s at Carswell AFB near Worth.

Eglin AFB Unit Redisignated as Lab

The Directorate of Armament Development at Eglin AFB, Fla., has been redesignated the Air Force Armament Laboratory, effective March 1, 1966.

The Air Force Armament Laboratory is responsible for exploratory, advanced and engineering development programs for non-nuclear munitions, targets and scorers, ballistics and associated areas.

The laboratory executes assigned projects and works closely with the Army, Navy and other Government agencies, and supports other Air Force Systems Command programs within assigned areas of responsibility.

Commanded by Col. Walter P. Glover, the Armament Laboratory is staffed by more than 300 military and civilian personnel. Laboratory activity is augmented by research and development contracts with industrial concerns and universities. Contracts currently in force are valued at over $50 million.

Two Handbooks on Civil Defense Emergency Available to Industr

The Office of Civil Defense has published two handbooks designed to help prepare the nation's industry for civil defense emergency. The two handbooks are titled, "Industrial Civil Defense Workbook" (Publication FG F 3.3) and "Industrial Civil Defense Seminars" (Publication FG F 3.2).

The purpose of the "Industrial Civil Defense Workbook" is to help the owners and managers of industrial and commercial enterprises prepare for survival in case of an attack on the United States. It is designed especially for use by proprietors or managers of facilities having relatively small staffs.

This booklet outlines the basic factors to be considered in making the company's civil defense plans. Because it provides space for recording the decisions, task assignments and other information needed to prepare the firm for a civil defense emergency, it serves as the frame the company civil defense pl

"Industrial Civil Defense nars" is a publication intende local civil defense directors, or industry executives, or oth ested persons who may be cal plan, organize and conduct i civil defense seminars.

The handbook contains a discussion of the factors on successful industrial civil seminar depends, as well as list of required actions that used to evaluate the complet seminar arrangements at ea of planning and managing su ference.

Copies of both publications obtained, free of charge, fr Army AG Publications Cent Defense Branch, 2800 Easter vard (Middle River), Baltim 21220.

Briefed below are some events and projects within the Department of Defense which may be of interest to writers and editors. If further information on any of these topics is desired, please write to Chief, Magazine and Book Branch, Office of Assistant Secretary of Defense (Public Affairs), Washington, D.C. 20301

AUTOMATIC WEATHER DEVICE DEVELOPED

Greatly improved weather forecasting capabilities have been provided Army field commanders with a new Atmospheric Sounding System. Heart of the transportable device is an automatic sounding set which processes data received from a sensing radiosonde carried swiftly aloft by specially designed balloons or rockets. Brief meteorological messages are produced by feeding into a computer information on temperature, humidity, wind speed and direction and atmospheric density. The system can also predict accurately the spread of atomic fallout.

LOW-MELT ICE CREAM BEING DEVELOPED

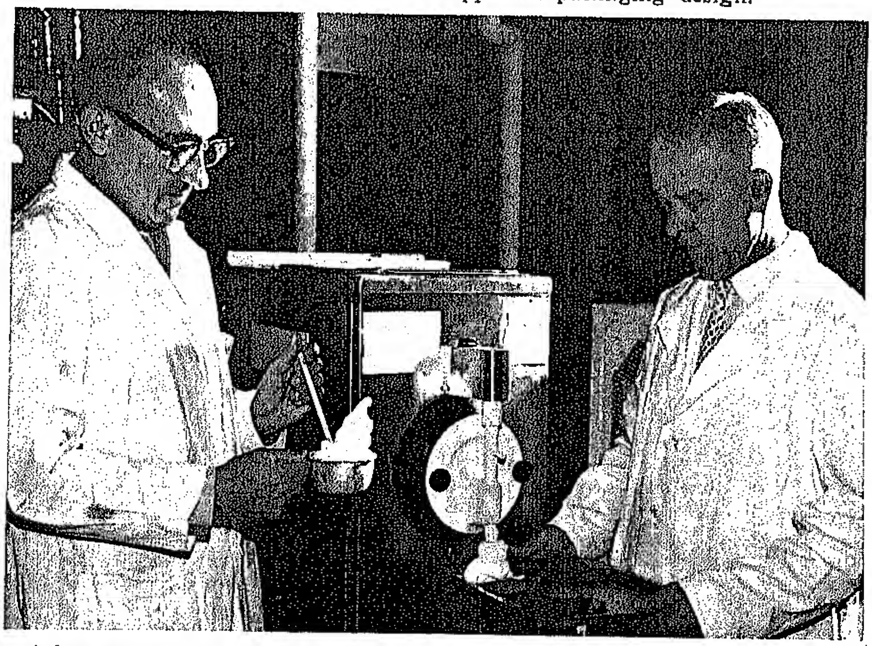
The Army is developing a low-melt ice cream for Navy submariners. Specifications call for an ice cream that will remain more than 80 percent unmelted for 15 minutes, even when served with other foods on a hot meal tray (about 100 degrees F.). The frozen dessert must also resist 80-degree room temperatures and look like, taste like and be as refreshing as the shore-dispensed product. By using additives and modifying the basic ice cream formula, the Army already has developed an ice cream that melted only 30 percent at 90 degrees during the test period.

EYE-BRAIN INFORMATION TRANSFER STUDIED BY NAVY COMPUTER

Navy scientists have adapted a computer technique to trace messages from receipt on the retina of the eye to their transfer to cognizant areas of the brain. The technique uses a flash stimulus the size of a pinhole in a large black background. Sensitive electrodes taped to the subject's skull record the arrival of the message in the brain. The computer measures the extremely short time delay between the eye and brain and between points at different locations in the brain. It also records the way the eye measures the growth of the amount of light from its first detection until it reaches maximum intensity. Furthermore, it is able to distinguish the difference in response between right and left eye and the strength of the input to the right and left lobe of the brain. A correlation between right and left eye strength and right and left handedness seems to be present.

AUTOMATED PACKAGING INFORMATION SYSTEM SLATED FOR DOD

A computerized system which automatically prints out packaging requirements for any item entering or already in the Defense Department inventory is being developed by the Air Force. The system will provide immediately usable packaging data based on characteristics of the item, mode of transportation, destination and other factors. Under the new concept, when an item requiring special packaging enters the inventory, the computer will be interrogated to determine whether an existing design will properly do the job. If no suitable design exists, engineers will develop a packaging method for the item. This information will then be fed into the data bank for future use on the same item or on items for which the design may be suitable. For items already in the inventory, the machine will quickly indicate the approved packaging design.



A low-melt ice cream for Navy submarines is being developed by food technologists at the U. S. Army Materiel Commmand's Natick (Mass.) Laboratories. Working on the project are Dr. Joseph Tobias (right), Professor of Dairy Technology, Food Science Department, University of Illinois, an Army Reserve lieutenant colonel who has a mobilization assignment at Natick, and Dr. Charles C. Walts of the Natick Laboratories' Food Division.

Trends in System and Cost Effectiveness Analysis

by
Lt. Gen. W. Austin Davis, USAF
Vice Commander, Air Force Systems Command

System effectiveness and cost effectiveness will be increasingly important concerns as our technology programs continue to advance and military systems become more complex and more costly. In addition, decision makers are being confronted with increasing options in systems approaches to meet given requirements. They must make qualitative and quantitative decisions that were unheard of until recent times.

Thus, the need is crucial for methods of assessing the effects of variations in technical and operational characteristics of weapons systems in order to achieve the best overall system effectiveness on a cost-acceptable basis. This means that we must further improve our analytical capabilities.

Both system effectiveness and cost effectiveness analysis are in their infancy. There are as yet no standard techniques for effectiveness prediction, evaluation and demonstration. We must have these standard techniques before we can have clear communication and, thus, real progress. The recently completed, year-long study by the Weapons Systems Effectiveness Industry Advisory Committee (WSELAC), which was sponsored by the Air F[illegible] (AFSC), [illegible] lardized [illegible] not purport to develop new techniques but rather to pull together the best of existing techniques in the numerous funtional areas that influence total system effectiveness.

We have the beginning of a standard approach, standard ground rules and a standard modeling concept for performing effectiveness analyses that will permit the Air Force to be selective between proposals and to compare one to the other, using a common base line. For the first time, management will be able to follow the analyst step by step through the analysis process, check his data and its course, review his assumptions and insure that he works from the agreed upon point of departure. After a system has been selected from several proposals, these same techniques can then be applied to the selection of components or subsystems within a weapon system and, later on in the life cycle, to evaluate proposed changes or modifications.

After the system becomes operational, the same analytical approach can provide a rational basis for selection between alternative solutions to operational and support problems. For example, if the in-commission rate is falling below acceptable standards, should the commander request additional maintenance personnel or test equipment? Or should he provide special training to upgrade his assigned personnel? Or should he admonish his crews for abusing (overstressing) their equipment? Or does he have a more subtle problem—morale?

Rapid and economic analysis can assist in solving these and a host of other related and interacting problems. An especially attractive and promising feature of the analytical framework proposal by the advisory committee is its ability to deal with constantly changing situations, changes in missions and changes within a mission. This technique considers the implications imposed by the multistate, multimode, multimission characteristics deemed so desirable in modern weapons systems.

The advisory committee also provided a number of significant recommendations in the area of system effectiveness and cost effectiveness evaluations; and it recommended improvements in our maintenance data collection system necessary to support system effectiveness analysis. But for cost data to support the cost effectiveness analyses, the committee by-and-large looked to another Systems Command study program. This latter effort is known as the Management Information System Project; it proceeded concurrently with and intermeshed closely with WSELAC.

The Management Information System Project was established to enhance the posture of the AFSC in the area of cost estimating credibility by developing improved financial management procedures. A basic deficiency in the past has been the lack of a system for pyramiding of financial data, all having a common structure, auditable from the lowest data bit to the highest summary aggregation and acceptable at all levels of review within the Air Force and the Office of the Secretary of Defense. To alleviate these problems, the Management Information System Project has provided three new procedures:

- First is a cost estimating procedure which provides uniform methods for presenting estimates and for tracing changes in estimates. In addition to enabling a more sophisticated analysis of contractor estimates, the procedure will improve our ability to make independent cost estimates in-house. It provides for documentation of all informatin used in formulating the estimates—including data sources, estimating relationships, estimate confidence and statement of estimate results.
- Second is a cost information system which is essentially a contractor reporting system. It provides a uniform method to display contract status in financial terms. It establishes basic contractor financial data input for development of budget estimates, financial plans, program change proposals and the contractor's response to the request for proposal (RFP). Also, it provides input to our cost data bank for use in developing cost estimates or conducting cost effectiveness analyses.
- Third is a cost accomplishment system which is an adaptation of Program Evaluation Review Technique (PERT) cost into a system more usable by the contractor and by our system program office (SPO) for program management. It provides for early visibility by the system program office of potential problems thus avoiding contract overruns.

With the WSELAC and the Management Information System Project we believe the necessary ground work has been established for improving the System Command's competence for performing system effectiveness and cost effectiveness analyses.

The need for effectiveness analyses in the conceptual and definition phase has been recognized for some time. Our 375 series of regulations and manuals address the matter rather directly. They describe management and engineering procedures to maximize total system/cost effectiveness. It remains for Systems Command to integrate the WSELAC methodology into the appropriate Systems Com

(*Continued on Page 18*

OF THE SECRETARY OF DEFENSE

ohn M. Malloy, Dep. Asst. of Defense (Procurement) ment Contracts Symposium, Fla., March 3-4.

B. Petty, Dir., Defense Audit Agency, at Third An- heastern Government Pro- Symposium, Orlando, Fla.,

. B. Lynn, Dep. for Audit ent, Defense Contract Audit t American Society for Pub- istrators Meeting, Albany, rch 29.

Gen. J. H. Weiner, USAF, Staff, Defense Communica- ncy, at Armed Forces Com- s Electronics Assn. Meet- nore, Md., April 12.

T. Cook, Dep. Dir., Defense Audit Agency, at National Management Assn. Sym- os Angeles, Calif., April 15.

MENT OF THE ARMY

arold K. Johnson, Chief of . Army, at Boston Univer- nguished Speakers Series, ass., Feb. 24.

'ank S. Besson, Jr., Com- General, U.S. Army Materiel at 8th Joint Industry-Mil- rnment Packaging Materi- lling and Transportation n, Sheraton Park Hotel, n, D.C. Feb. 28; at Western lub, Chicago, Ill., March 21.

William F. Cassidy, Chief Engineers, at American Con- Surveying & Mapping/ Society of Photogrammetry Hilton Hotel, Washington, h 9.

n. Austin W. Betts, Dep. Research and Development, University, Houston, Tex.,

n. David P. Gibbs, Chief of ations-Electronics, at Armed ommunications Electronics ting, Fort Monmouth, N.J.,

MENT OF THE NAVY

bert N. Morse, Asst. Sec- the Navy (Research and nt) at Commissioning of OOKE (DEG-1), Seattle, b. 26.

[. Rivero, Vice Chief of rations, at National Secur- ity Commission, American Legion, Washington, D.C., March 2.

RAdm. H. J. P. Foley, Asst. Chief, Bureau of Supplies and Accounts, at Southern States Regional Traffic Safety Conference, Chattanooga, Tenn., March 9.

VAdm. Charles B. Martell, Dir., ASW Programs, Office of Chief of Naval Operations, at Naval Reserve Assn. Luncheon, Washington, D.C., March 15; at American Society for Quality Control, Los Angeles, Calif., March 22; at NROTC Convocation, Purdue University, North Lafayette, Ind., April 18.

VAdm P. H. Ramsey, Deputy Chief of Naval Operations (Air), at General Dynamics/Fort Worth Management Dinner, Fort Worth, Tex., April 21.

DEPARTMENT OF THE AIR FORCE

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff (Systems & Logistics), at National Security Seminar, Carbondale, Ill., March 31-April 1.

Gen. B. A. Schriever, Commander Air Force Systems Command, at American Society for Public Administration, Washington, D.C., April 14; at American Ordnance Assn. Meeting, Washington, D.C., May 5.

Lt. Gen. R. L. Bohannon, Surgeon General, at Aerospace Medical Assn. Meeting, Las Vegas, Nev., April 18-21.

Maj. Gen. John W. O'Neill, Commander, Electronic Systems Division, Air Force Systems Command, at National Telemetering Conference, Boston, Mass., May 10.

Army Engineers Given Cement Testing Tasks

The Army Corps of Engineers has assumed the function of procurement testing cement for Federal Government agencies, a service previously performed by the National Bureau of Standards.

The job involves sampling and testing cement furnished by contractors for use in construction projects being performed by the Army Department and other Federal agencies including the U.S. Bureau of Reclamation and the Navy's Bureau of Yards and Docks.

Sampling and testing activities have been assigned to three Corps of Engineer field facilities, each of which will serve geographic areas as follows:

North Pacific Div., Army Corps of Engineers, Portland, Ore.—Montana, Wyoming, Utah, Arizona, Nevada, Washington, Oregon and California.

Ohio River Div., Army Corps of Engineers, Cincinnati, Ohio—All states east of, and including, North Dakota, South Dakota and Nebraska and all states north of, and including Missouri, Tennessee and Virginia.

U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss.—Colorado, Kansas, New Mexico, Oklahoma, Texas, Arkansas, Louisiana, Mississippi, Alabama, Georgia, North Carolina, South Carolina and Florida.

AF Begins Development of Automatic Field Telephone

Development of an advanced automatic radio telephone system specially adapted for military use in forward areas has been started by the Air Force Systems Command's Electronic Systems Division at L.G. Hanscom Field, Mass.

Designed to be carried manually, the system will have a rugged configuration that will permit it to be air dropped and operated almost anywhere in the world under the most severe weather conditions.

Each system will provide for 14 simultaneous conversations with up to 200 connections over an area five miles in diameter.

Without its battery, each hand set will weigh about 15 pounds while the repeater or nerve center of the system will scale about 100 pounds, distributed into three back packs.

The new design will provide private, high quality voice communications that can be instantly set up, dismantled and relocated in accordance with military requirements.

Present timetable calls for delivery of a prototype by December 1966 to be followed by rigorous field testing to simulate combinations of extreme temperatures, humidity and windblown sand and dust.

NORAD Reorganization To Become Effective April 1

The North American Air Defense Command (NORAD) will undergo an overall reorganization of its Air Force, Army and Royal Canadian Air Force components effective April 1.

The realignment is in consonance with the changing emphasis of the major threat to North America from manned bombers to ballistic missiles and overall improvements being made to the air defense weapons control system.

Revamping of NORAD and its components coincides with the acquisition of an improved back-up interceptor control (BUIC) system. The improved BUIC system is a dispersed, automated weapon control system which, coupled with the semi-automatic ground environment (SAGE) system, increases flexibility of the manned bomber defense and gives greater assurance that sufficient air defense capability will survive a ballistic missile attack to effectively counter the manned bomber threat.

North American Air Defense Command.

The reshuffle calls for the realignment of the six numbered regions into four geographically designated areas to be called Western, Central, Southern and Eastern NORAD regions. The Alaskan NORAD region, headquartered at Elmendorf AFB, Alaska, and the Northern NORAD region, headquartered at North Bay, Ontario, Canada, will be retained. The city-named NORAD sectors will be redesignated as numerical divisions.

New regional sectors, their headquarters and changes to take place follow:

Western NORAD Region, Headquarters—Hamilton AFB, Calif. The new Western NORAD Region will encompass the area and forces of the 28th NORAD Region at Hamilton and the 25th NORAD Region at McChord AFB, Wash.

The 25th NORAD Region, the Reno Sector with headquarters at Stead AFB, Nev., and the Los Angeles NORAD Sector with headquarters at Norton AFB, Calif., will be inactivated and the semi-automatic ground environment (SAGE) facilities associated with these units phased out. These control functions will be transferred to the SAGE facility at Hamilton AFB and to the new BUIC facilities.

Western NORAD Region will consist of the Seattle NORAD Sector which will be redesignated as the 25th NORAD Division; the Portland NORAD Sector, redesignated as the 26th NORAD Division, to encompass the area and forces of the present Reno Sector; and the Phoenix NORAD Sector, redesignated as the 27th NORAD Division, encompassing the area and forces of the present Los Angeles Sector.

Central NORAD Region, Headquarters—Richards-Gebaur AFB, Mo. The Central Region will replace the 29th NORAD Region and will encompass the area and forces now assigned to the 30th NORAD Region at Truax AFB, Wis., which will be inactivated.

Central NORAD Region will be composed of the Great Falls NORAD Sector which will be redesignated the 28th NORAD Division; the Duluth NORAD Sector redesignated the 29th NORAD Division; the Sioux City NORAD Sector redesignated the 30th NORAD Division; and the Chicago NORAD Sector redesignated the 20th NORAD Division.

Southern NORAD Region, Headquarters—Gunter AFB, Ala. The Southern NORAD Region will replace the 32nd NORAD Region, and will be composed of the forces assigned to the Montgomery NORAD Sector, which will be redesignated at 32nd NORAD Division; and the Oklahoma City NORAD Sector, which will be redesignated from the present 29th NORAD Region to the 31st NORAD Division.

Eastern NORAD Region, Headquarters—Stewart AFB, N. Y. The Eastern NORAD Region will replace the 26th NORAD Region. It will be composed of the Washington NORAD Sector, redesignated the 33rd NORAD Division; the Detroit NORAD Sector, redesignated the 34th NORAD Division; the Boston NORAD Sector redesignated the 35th NORAD Division; and the New York NORAD Sector redesignated the 21st NORAD Division.

U. S. Air Force Air Defense Command.

Reorganization of the U. S. Air Force Air Defense Command (ADC) parallels the NORAD structure within the continental United States. ADC will establish four numbered air forces to replace the numbered ADC air divisions and will redesignate the geographically named ADC sectors as numbered air divisions.

Numbered air forces to be established are the 4th at Hamilton AFB, Calif; 10th at Richards-Gebaur AFB, Mo.; 1st at Stewart AFB, N. Y.; and 14th at Gunter AFB, Ala. The commanders of the Eastern, Southern and Central NORAD regions also will command the numbered air force co-located at the same base.

Changing the designation of the sectors to numbered air divisions is being done to make the organization of ADC consistent with the structure of other USAF major air commands such as the Tactical Air Command and Strategic Air Command. The numbers assigned to the ADC air divisions will be identical to those of the NORAD divisions and both will be commanded by the same individual.

U.S. Army Air Defense Command.

The U. S. Army Air Defense Command (ARADCOM) will realign its boundaries on April 1 as part of the overall reorganization of NORAD. ARADCOM will reduce its number of region commands from five to four and will establish new geographical areas of responsibility for three of the regions. Two region headquarters will be moved.

Areas of responsibility of the four ARADCOM regions will conform to boundaries of NORAD regions within the United States.

Headquarters of 1st Region, ARAD COM, will remain initially at Fort Totten, N. Y., and present boundaries will be retained. In the fourth quarter of Fiscal Year 1967, this headquarters will move to Stewart AFB, N. Y., to co-locate it with the headquarters of Eastern NORAD region.

Sixth Region, ARADCOM, will remain headquarters at Fort Baker, Calif., but its area will be enlarged to include 7th Region, ARADCOM, at McChord AFB, Wash. The 7th will be discontinued. The commander of the Western NORAD Region will also be the 6th Region commander.

Second Region, ARADCOM, will keep its headquarters at Richards-Gebaur AFB, Mo. The boundaries of the reconfigured 2nd Region will coincide with those of the Central NORAD Region.

Headquarters of 4th Region, ARAD COM, will be moved from Fort Sheridan, Ill., initially to Maxwell AFB, Ala., and finally to Gunter AFB, Ala. The boundaries of the reconfigured 5th Region will coincide with those of the Southern NORAD Region.

RCAF Air Defense Command.

RCAF Air Defense Command will be affected by the change in boundaries and redesignation of sectors in which units of the Canadian command are located.

FROM THE SPEAKERS ROSTRUM

Excerpts from address by Willis M. Hawkins, Asst. Secretary of the Army (Research & Development), at the Association of the U.S. Army Symposium on Reconnaissance and Surveillance, Fort Huachuca, Ariz., Jan. 26, 1966.

Hon. Willis M. Hawkins

A Need for New Concepts for Surveillance and Target Acquisition

. . . What I propose to do is discuss in a simplified way how I feel the surveillance and target acquisition mission fits into Army operations; to outline for you the status of our current concept efforts; touch lightly on the potential of various technical approaches that have been suggested; and, finally, outline in a very brief way some of the serious responsibilities which the Army, DOD and the industry must assume in order that we can get on with development in a rational fashion.

I hope in this discussion to emphasize one thing and that is the futility of continuing to escalate the gathering of information even though we can conceive of many ingenious ways to sort and display it. We must return to a concept of handling only essential data.

Army System Dependence on Enemy Information.

In trying to discuss the system approach to surveillance and target acquisition, we must remember that the system approach in the Army is somewhat different than the system approach that has been so successful in analyzing strategic systems. . . . I would like to suggest, however, that the Army in its entirety is, in fact, one system and the subsystems which make it up cover a variety of functions and operations in a complex and necessarily flexible manner.

As we turn to the reconnaissance problem and the systems we would like to have to solve this problem, I think we will note that most of these systems actually work in one of two modes. In one case, these subsystems are short lead time closed loop systems and, in the other, the lead times are so great that they are, to a first approximation, open loop arrangements. In order to describe what I mean by the closed loop—open loop breakdown, I would like to discuss first the closed loop type of reconnaissance system. These are the systems that have the following specific purposes:

- The location and description of enemy combat elements.
- Real time fire direction.
- Real time damage assessment.
- Surveillance of combat troop and equipment movement.

You will recognize in this list that I have attempted to seek out those functions where the local commander is immediately responsible for the action and reaction to the information. This is what I call closed loop.

Let us now take a look at what I mean by open loop or long lead systems. In this particular case the systems do the following:

- Define the environment for potential battle including permanent features of geography of the zone of combat.
- Determine the long range potential of the enemy such as the change of his support or relief elements, or the onset of major buildup.
- Locate and describe logistical and facility targets.
- Long range damage assessment.

As you see from a comparison of these two groups, the closed loop portion is characterized by immediate action and reaction resulting from information gained. Open loop is characterized as foundation information for future operation and carefully planned interdiction.

Status of Concept Development.

Keeping in mind the closed loop and open loop groupings that I have just outlined, I would now like to discuss where we stand with respect to our development of concepts. Historically, sensor development has generally lagged vehicle development, if vehicles are involved in the system, and both, unfortunately, have preceded logical overall reconnaissance system concept creation. This has put the commander in a position of having to develop his own systems concepts in the field using the tools at hand. Being ingenious, a number of tactics have been developed, not the least of which is reconnaissance by fire. This is a firm tactical concept and is an extremely useful one. It probably accounts for the lions share of target acquisition in situations such as we are experiencing in Vietnam. The utter simplicity of the concept cannot be denied but certainly the cost in lives and the lack of precision should be a challenge to every technical man. There must be a better way of finding the enemy than standing up to see who shoots at you.

I would like to suggest that those of us, who attempt to work in the concept creation part of the business, might better have spent our time in the past with careful analysis of the field commanders' functions as a starting point for creating surveillance and target acquisition systems. We have to decide the following:

- At what level in the command organization must the quick reaction systems close the loop? I'd like to suggest that we have tended to put this level too high.
- How much raw data does a field commander really need? How much

I am talking about. It is obvious that this immediately suggests the vast computer I have just described. What I want to suggest is some sort of "at source" correlation that sends only correlated information to the commander. Another technical scheme, that might be used in some kind of correlative system, is the sampling of air. Devices to do this successfully are beginning to emerge from our laboratories. The importance of such a capability, utilized either by the infantryman or in aircraft, is yet to be determined.

There is one kind of correlation and filter scheme, which is now in development, that illustrates some of the characteristics that I have been explaining. We call it VATLS, or Visual Airborne Target Location System. In this system we use the eyeball and brain of an observer in an aircraft, who utilizes a telescope on an inertial reference platform aided by ground tracking (developed from missile control system). All that is transmitted to the ground is the elevation angle, azimuth, altitude and range, relative to the aircraft, of targets sighted by the observer. The tracking system locates the observing aircraft and closes the loop to determine the accurate location of the target. The system is moderately complex, but it has the extreme advantage of maximum simplicity in data handling in that it relieves the commander of any filtering task. The system, in fact, can relieve the commander of involvement in the weapon system loop, if the system is hooked to the artillery or is used to command support aircraft.

We have many subsystems operating in the field that are not directly linked together for mutual support. Obvious in this area are systems which provide electronic intelligence to a very high and, sometimes isolated, element of command. This information could be classified as "trigger" mission intelligence; and it must somehow be more closely linked to quick response or spot systems which obtain correlation information of different kinds, or, perhaps, directly to weapons.

The consideration of combined systems inevitably brings up the problem of interservice responsibilities in any kind of a tactical operation. In the discussion of these systems, the "federation" suggested by Dr. Fubini, in our discussions over the past few years, seems to me to be a concept in which the potential is very large. The prime danger, in contemplating combined systems, is that we will attempt to so thoroughly integrate all the elements that the resulting system is too complex and, therefore, there can be only one. This reduces the flexibility so necessary on the high intensity battlefield, and even more essential to accomplish intelligence-gathering in low level and counterinsurgency types of conflict. Therefore, in thinking of combined systems, we must be careful not to create unique monsters, but to try to create tactical command systems, which hav ethe potential of a complex combined system or the individual effectiveness of the subsystems as the case determines.

Before closing our discussion of the potential of our present technical capability, I should like to point out the obvious fact that none of the current completed developments have attacked the problem of handling the display, the filtering, or the sorting for easy decision by the commander. I have been emphasizing the desirability of correlating and filtering the information so that he gets only what he needs. We all know how difficult this is going to be. We know that, if asked, he will want flexibility; therefore, he will want some excess information in order to be confident that he has enough. No matter how much filtering we do at the source, we must certainly do something in the area of logical information display to show the combat commander what he needs a lot faster and more clearly. Certainly there is more than we can do beyond worn out maps and crayons. A simple idea here, I believe, will do us a great deal of good.

Specific Responsibilities in Concept Development.

All of us involved in the effort to create the best possible reconnaissance and surveillance systems have individual responsibilities. They obviously can't be defined in such a mannre that there is no overlap, but there are certain areas of responsibilities that are unique to the large organizations attempting to develop these systems. I would like to suggest the following:

• **Army responsibility.** In the Army we have recognized that we are, in fact, the only organization that can write the requirements for these systems. We are the ones who demand the information and who must react to it. So far our definition of these requirements has failed to be a real definition, and we must recognize our responsibility to do something better than the routine listing of everybody's desire for information as a basis for requirements. I have been talking about filters throughout this discussion. I recognize that it is the Army's responsibility to put a filter on its requirements so that those who do the development have a specific problem to attack.

I think the Army, in the development of requirements, should try to set up some experimental operations. We have attempted to develop many detailed military tactics through the use of operational tests, but we have not attacked the surveillance and target acquisition function in any specific operational test. This may be a long program but I think it is an essential one, and we should approach its planning now.

The Army must certainly analyze its security rules to see if we have any information-gathering systems artifically hidden behind closed doors in such a manner that the output is not available for immediate response by operational commanders.

Finally, I recognize that the Army has a distinct responsibility to assemble the best possible concept systems talent, in order to combine many individual technical developments and ideas into operational systems where the combined capabilities of the various technical devices are welded together in optimum ways.

• **Industry responsibility.** For those of you in industry, I think that there are several major responsibilities which you should consider. I would like to suggest that you first look at your gadget peddlers. I know that many of you feel that the Government is peculiarly blind when it comes to looking at new ideas. I felt that way myself when I was in industry. I now have a different view of the problem and I would like to admit that the Government is not all immune to strong sales effort, and it has too often succumbed to clever but actually useless ideas. These ideas rarely come to complete fruition because they eventually die in the light of reason. They have in the process, however, absorbed a substantial amount of talent and attention, and the same technical people could have been creators had

fat instrument rarely cuts through anything. Yet with each new project, our System Project Offices (SPO) get bigger. If we aren't careful, we will become the victims of Parkinson's fourth and newest law, namely: "Any group of 1,000 or more generates enough activity within itself that it needs no contact with the outside world."

I have been flippant on this subject, but there is a serious side to it. As we seek to impose more responsibility on our industrial contractors, through fewer cost type contracts and with terms arrived at in competition, we must descipline ourselves to couple that responsibility with the authority needed to carry it out.

Responsibility and authority are twins and, if we require industry to accept responsibility, we must not withhold the authority to fullfill it. You may have heard of the "total package" concept with which we are experimenting on the C-5A program and which, if successful, we intend to apply to other programs such as the Short Range Attack Missile (SRAM). Stripped to its essentials, the total package plan is intended to permit the award of contracts competitively, where performance and schedule are related to cost, and on a basis of total responsibility. These are the key words. We in the Government have for many years been living in an atmosphere of "cost-plus and sole source," where more controls by the customer are needed; and this relinquishment of authority will, for many, be a shocking experience. But it must be done if we are to get the best results—performance, schedule and cost—from our industrial partners; and you are the ones who will have to do it.

While methods change, and nations change and world situations change, there is one constant—the need "to provide for the common defense"—the need to protect the substance of past achievements and the means for future accomplishments.

The great challenge before us lies in managing our resources in such a way as to derive the maximum benefits from the application of science and technology to our defense needs. A major share of this management task falls on the system/project managers.

Our national security depends on our ability to act effectively through the entire spectrum of conflict, whether it is confined to the psychological-political-economic area, whether it brings on a number of "brush fire" wars, or whether it bursts into a major non-nuclear or into an all-out general war. I think it is fair to say that the danger of general nuclear war is receding, largely because of the strength and readiness of our strategic forces. At the same time, the danger of lesser conflict—the euphemistic "war of liberation"—is increasing.

A few months ago, there was an article written by Lin Piao, Vice Premier of Red China. That article states quite frankly not only what Peking's intentions are in Asia, not only what Peking's intentions are in Vietnam, not only what Peking's intentions are toward the United States, but what Peking's plans are for the expansion of world communism.

Lin Piao makes this interesting point. The Chinese Communist revolution differs from the Russian revolution in one essential respect. The Russian revolution "began with armed uprisings in the cities, and then spread to the countryside," he notes, "while the Chinese revolution won nationwide victory through the encirclement of the cities from the rural areas and the final capture of the cities."

And here is the kicker: the "rural areas of the world" today, Lin Piao asserts, are Asia, Africa and Latin America. The "cities of the world" are North America and Western Europe.

Just as communism in China succeeded by first capturing the countryside, then encircling and absorbing the cities, so will the global communist movement ultimately succeed first by capturing Asia, Africa and Latin America, thereby encircling North America and Western Europe. Then, says Lin Piao, the United States and its allies will be ready for annihilation.

And where is all this to begin? It has already begun, he replies. That place is in Vietnam. Vietnam, he says, is the "focus" of the revolutionary movement. No matter what action the United States may take in Vietnam, he insists, the Communist Chinese are "unshakable" in their determination to drive the United States out of Southeast Asia.

Lest anyone doubt that the North Vietnamese disciples are taking cues from their Chinese mentors, we have this recent statement of General Giap, the experienced leader of North Vietnam's army: "If the special warfare that the U.S. imperialists are testing in South Vietnam is overcome," he says, "then it can be defeated everywhere in the world."

Obviously, we must be prepared for a variety of contingencies in this troubled world. While this country can afford whatever is needed for defense, we cannot afford to waste any of our resources. This is why systems management is so vitally important, and why the roles which you will play in the years ahead will be decisive.

Within a few days you will start again on the daily collision course with the problems of men and resources. From now on, throughout your careers, you will have progressively greater responsibilities in the direction of man and the use of material. I would caution you about only one aspect of your responsibilities that of overmanagement. By this I mean, not only overcontrol of industrial contractors, to which I referred earlier, but also any rigidity of control of the actions of the subordinates and of the functions under your direction. The loss of an Army mule a few decades ago was a serious business—Lincoln said they were more expensive to replace than generals. But the loss of a mule then does not compare with the loss of one of today's prime movers. The same ratio applies to every item of equipment throughout the military establishment.

It is common experience to learn more from our mistakes than from our successes, for painful errors sharpen the senses while triumphs can dull them. You would not be in this class if you were not able to profit from your errors, and it is highly possible that you would not be here had not a superior somewhere along the line judged you worth saving, despite at least one real blooper. I ask that, as you move into the upper echelons of your Services, you do likewise with juniors who are worthy of the effort. Let them learn from mistakes in positions of lesser responsibility so that they will make fewer when they are in the senior councils where the cost of errors is astronomically higher.

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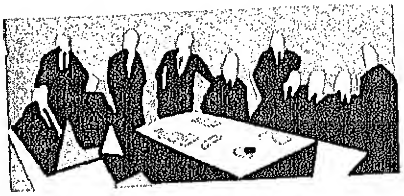

MEETINGS AND SYMPOSIA

APRIL

Conference on Ground Based Aeronomic Studies of the Lower Ionosphere, April 11–15, at the Defense Research Telecommunications Establishment (DRTE), Ottawa, Canada. Co-sponsors: Air Force Cambridge Research Laboratories and DRTE. Contact: W. Pfister (CRUB), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01731, (Area Code 617) CR 4-6100, ext. 3019.

Symposium on Generalized Networks, 14th in a series of international symposia organized by the Polytechnic Institute of Brooklyn Microwave Research Institute, April 12–14, at New York City. Sponsors: Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, Society for Industrial and Applied Mathematics and the Institute for Electrical and Electronics Engineers. Contact: Lt. Col. E. P. Gaines, Jr. (SREE), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D.C. 20333, (Area Code 202) OXford 6-3671.

Fourth Symposium on Remote Sensing of Environment, April 12–14, at the University of Michigan, Ann Arbor, Mich. Co-sponsors: Air Force Cambridge Research Laboratories and Office of Naval Research. Contact: C. E. Molineux (CRJT), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01731, (Area Code 617) CR 4-6100, ext. 3620.

Twentieth Annual Frequency Control Symposium, April 19–21, at the Shelburne Hotel, Atlantic City, N.J. Sponsor: Army Electronics Laboratories. Contact: M. F. Timm, Solid State & Frequency Control Div., Army Electronics Laboratories, Fort Monmouth, N.J., (Area Code 201) 5-1728.

Mathematical Aspects of Computer Science, dates undetermined, at New York City. Sponsors: Air Force Office of Scientific Research, Army Research Office-Durham, Institute for Defense Analysis, Association for Computing Machinery, Association for Symbolic Logic and the American Mathematical Society. Contact: Capt. J. Jones, Jr. (SRMA), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D.C. 20333, (Area Code 202) OXford 6-1302.

MAY

Symposium on Electrode Processes, May 1–6, at Cleveland, Ohio. Co-sponsors: Air Force Office of Scientific Research and the Electrochemical Society. Contact: Lt. Col. M. D. Sprinkel (SRC), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W. Washington, D.C. 20333, (Area Code 202), OXford 6-8706.

Bionics Symposium 1966, May 3–5, at the Sheraton Hotel, Dayton, Ohio (rescheduled from March). Co-sponsors: Aerospace Medical Research Laboratory and the Avionics Laboratory. Contact: Dr. H. L. Oeistreicher (MRBAM), Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio, (Area Code 513) 253-7111, ext. 3-6108.

Ninth Navy Science Symposium, May 5–6, at Departmental Auditorium, Constitution Ave., between 12th and 14th Streets, N.W, Washington, D.C. Sponsor: Office of Naval Research. Contact: Robert J. Mindak, Conference Chairman, Office of Naval Research, Department of the Navy, Washington, D.C. 20360, (Area Code 202), OXford 6-4720.

JUNE

Electromagnetic Windows Symposium, June 1–3, at the Georgia Institute of Technology, Atlanta, Ga. Sponsor: Air Force Avionics Laboratory. Contact: R. Ireland (AVWE-3), Air Force Avionics Laboratory, Wright Patterson AFB, Ohio 45433, (Area Code 513) 253-7111, ext. 5-5720.

Fifth U.S. National Congress of Applied Mechanics, June 14–16, at the University of Minnesota, Minneapolis, Minn. Sponsor: Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, American Physical Society, American Society of Civil Engineers, American Society of Mechanical Engineers for Experimental Stress Analysis, American Institute of Aeronautics and Astronautics, American Mathematical Society, Society for Rheology and American Society for Testing and Materials. Contact: Maj. Lawrence P. Monahan, Jr., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706, (Area Code 919) 286-2285.

International Conference on Crystal Growth, June 20–24, at Boston, Mass. Sponsor: Air Force Cambridge Research Laboratories. Contact: Mr. Charles S. Sahagian (CRWPC), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Mass. 01731, (Area Code 617). CR 4-6100, ext. 3298.

Second Rochester Conference on Coherence and Quantum Optics, June 22–24, at the University of Rochester, N.Y. Co-sponsors: Air Force Office of Scientific Research and the Air Force Cambridge Research Laboratories. Contact: Dr. M. C. Harrington (SRPP), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S.W., Washington, D.C. 20333, (Area Code 202) OXford 6-4464.

Cold Spring Harbor Symposium on Quantitative Biology, dates undetermined, at Cold Spring Harbor, N.Y. Sponsors: Cold Spring Laboratory for Quantitative Biology, Air Force Office of Scientific Research, National Institutes of Health, National Science Foundation and the Atomic Energy Commission. Contact: Dr. R. V. Brown (SRLA), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave. S.W., Washington, D.C. 20333, (Area Code 202), OXford 6-4181.

Trends in System and Cost Effectiveness Analysis

(Continued from Page 10)

mand management and engineerin documentation, but first we mus verify and validate these procedure This is being accomplished on s lected systems representing eac phase of the weapon system li cycle. The techniques must be refin and improved; a better data ba must be established; and, as wea nesses are recognized, research plug the gaps must be initiated.

Above all, we must insure a meth ology of effectiveness analysis wh avoids the danger of discouraging Air Force and the DOD from appr ing daring program approaches, si these alone can give us the quant gains in military capability which so vital to our national survival.

Subcontracting Program Spreads Defense Dollar Nationwide

When the Defense Department spends a dollar toward building modern weapons systems, little pieces of that dollar go into virtually every state in the nation affecting the economy of thousands of cities, towns and communities. An example of the spread of defense dollars throughout the land is the history-making subcontracting programs of the Lockheed-Georgia Co. of Marietta, Ga., a division of Lockheed Aircraft Corp., which is prime contractor for the latest giant cargo-troop carrying aircraft for the U.S. Air Force—the C-141 Starlifter and the C-5A.

The money being spent on these two aircraft—the total for airframes exceeds $2 billion (the engines, contracted separately to other firms, exceed $1 billion)—isn't concentrated in the town of Marietta, Ga. Most of it fans out across the country to subcontracting firms—large aerospace corporations, small businesses and companies in labor surplus areas, who build large chunks of the new planes; or to vendors, who provide nuts and bolts, etc. Of the amount which the Marietta company retains "in house," it places some in its own sub-assembly plants located, or being located, in Appalachia areas and elsewhere, and buys much raw material from other Georgia firms and companies in other states.

It is impossible to determine how many people make a living, or part of their living, from the Defense Department's programs on these two aircraft—one of which is in full production and the other just preparing to go into production. Twenty-two thousand employees of the Lockheed-Georgia Company come from half of the 159 counties of Georgia. This figure also includes about 150 in a sub-assembly plant in Clarksburg, W. Va., and 300 or more in a sub-assembly plant at Charleston, S.C. Additional sub-assembly plants will be opened in Shelbyville, Tenn., Martinsburg, W. Va., Uniontown, Pa., and Logan, Ohio.

Lockheed can count 1,200 companies involved in the C-141 program. It currently is conducting, with Air Force review, competitive bidding to select subcontractors for the C-5A, an aircraft twice the size and twice the cost of the C-141.

Major subcontractors and subsystems contracts on the Starlifter are shared by 33 companies over the United States. Whatever the total of the employees of the subcontractors and vendors, who draw their paychecks from funds derived from the C-141, it can be multiplied by five to give a truer estimate of the number whose livelihood is affected by this defense program. This is because in the communities involved there are grocers, clothiers, furniture dealers, realtors, barbers, gasoline service station operators, car dealers, appliance dealers, etc., who feed, clothe, house and, generally, care for the needs of those who are working specifically on defense contracts.

So, when a dollar leaves Washington, it travels far and wide as it involves thousands in building a weapon system for the Defense Department.

Examples of the Flow of the Defense Dollar in Subcontracting Programs.

After receiving the prime contract on the airframe of the C-141 from the Air Force Systems Command's Aeronautical Systems Division, Lockheed's plant in Georgia sublet the wing to Avco Corp. in Nashville, Tenn., in competitive bidding. The wing includes a fuel pump. The Tennessee subcontractor, Avco, obtained the fuel pump from Pesco in Bedford, Ohio. To build the fuel pump, Pesco needed, among other things, a switch and a cannon plug. The Ohio firm bought the switch from the Micro Devices Co. of Dayton, Ohio, and the cannon plug from a concern in Los Angeles, Calif.

At this point, the defense dollar really begins to flow into communities over the United States. Micro of Ohio gathers components for the switch from the following areas: wire, from Westbury, N.Y.; glass, Shanton, Conn.; electrical material, Chicago and New York; disc, Cincinnati, Ohio; springs, Cincinnati; ceramics, Paramoit, Calif., and Sun Prairie, Wis.; epoxy, Canton, Mass.; and silver from New York City.

The Los Angeles firm providing the cannon plug for Pesco's fuel pump follows a similar pattern in obtaining components from companies spread out over the nation.

Thus, the dollar for the Starlifter wing travels over Georgia, Tennessee, Ohio, California, New York, Connecticut, Illinois, Wisconsin, Massachusetts and other states.

A tracing of the path of the defense dollar through the subcontracting and vending program involving other parts of the Starlifter would find it in virtually every state going from prime contractor to major subcontractors into the third and fourth levels, to vendors and suppliers ad infinitum.

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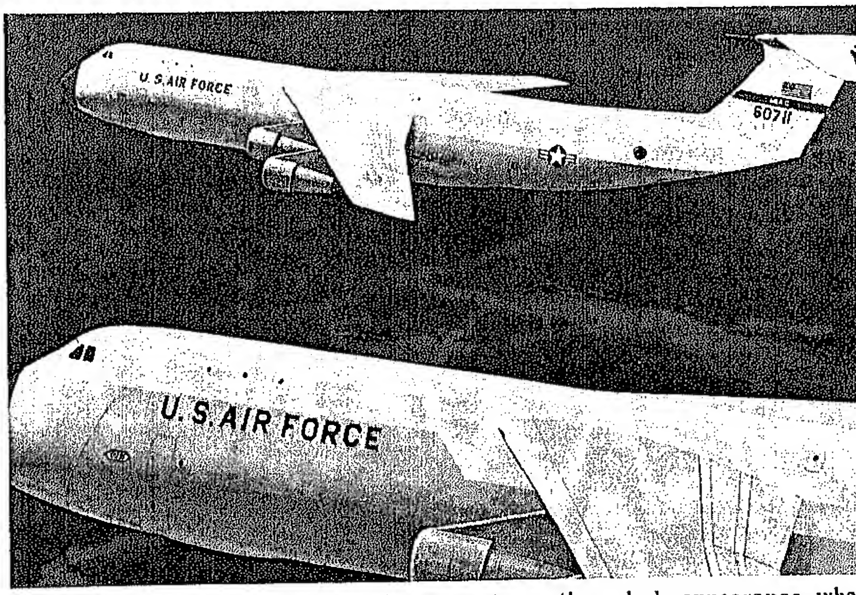

The U. S. Air Force's C-5A will present a rather sleek appearance when it goes into operation in 1969, as this artist's concept of two of them in flight indicates.

The organization of corps and Army aviation companies is to be revised substantially so as to provide pooled aviation resources to serve the requirements of units located in the corps area, field army area and communications zone, as well as to reinforce divisions and other units having organic aviation.

The extensive nature of the changes recommended by the ARCSA study will undoubtedly generate heated reactions in some quarters in that this study represents a "bare bone" rather than an "optimum" statement of requirements for Army aviation. Nevertheless, the study does represent the best possible assessment in the light of present-day knowledge geared to the other forces of the Army. On this basis the study provides a more solid foundation upon which the distillation of new experience and increased knowledge can be applied.

Despite the numerous changes recommended by the ARCSA study, the overall quantitative requirements for aircraft and personnel to support the recommendations represent only minor changes from objectives previously stated by the Army.

The other major change during the past year was the creation of an airmobile division. Many lessons were learned from the air assault tests. One of the first things learned was the division's logistical impact and the amount of tonnage that would be handled. The average daily consumption for the division was 555 tons as compared to 450 for an infantry division. The main reason for the increase in tonnage is the requirement for additional aviation fuel.

During Air Assault II we consumed almost three million gallons of POL. Total tonnage consumed was over 18,000 tons. Movement of this tonnage required 10,000 aircraft sorties, half of which were flown at night. The exercise showed that air lines of communication can be established in the combat zone and sustained over long periods of time to support an airmobile division. We also established that the speed with which an airmobile division can accomplish its mission indicates that it will consume 50 percent less tonnage than an infantry division on a similar mission.

Another lesson learned from the air assault tests was the Army's capability to maintain the large numbers of aircraft. This was accomplished with flying colors. The large Chinooks were exposed to field conditions for the first time on a large scale and were available 60 percent of the time. The Mohawk had almost 80 percent availability. The UH-1's, the workhorse of the division, attained the rate of 85 percent. All of the availability rates exceeded the Department of the Army's standards.

The question of sustainability was another unknown. During Air Assault II, aircraft of the division flew 30,000 hours and not a single operation had to be cancelled because of lack of aircraft. The performance and utilization rates were exceptionally high and indicated that aircraft can be operated on a sustained basis. As an example, the Hueys, on the peak days required, got up to 9-10 hours in one day. The average crew flew about 200 hours during the two months of extensive field testing. This utilization compares favorably with that of ground vehicles.

Another big question in many peoples' minds was that of the vulnerability of the helicopter. We have conducted elaborate experiments at the Combat Development Command Experimentation Center. The most important finding is that relatively slow, low flying aircraft are less vulnerable to visually sighted weapons than earlier analytic estimates and opinions had indicated. Statistics from Vietnam offer impressive proof of the helicopter's survivability. The statistics based on about 766,000 combat sorties reveal that a helicopter will be hit by ground fire once in every 325 combat sorties; it will be downed only once in every 6,400 combat sorties; and it will be lost to ground fire only once in about 13,000 sorties.

Another area investigated was that of interface with the Air Force.

I would like to dispel the notion that an airmobile division reduced the Army's requirement for support from the Air Force. Both the Army and Air Force have logistical roles in the air lines of communication which are complementary. The air lines of communication are divided into wholesale operations—bulk delivery to the logistical base, and retail operations—tailored loads delivered to the user. The Army is primarily responsible for the retail delivery, while the Air Force is responsible for the wholesale delivery.

The Air Force allocated 30 sorties per day for close air support during the Air Assault II exercise. The need for extensive Air Force support of airmobile operations was clearly revealed. The division cannot operate adequately without the support of Air Force fighter bombers for close support, reconnaissance aircraft for deep intelligence-gathering missions and transport aircraft for wholesale delivery of supplies. The Air Force provided excellent support in all of these categories during Air Assault II and it is continuing to do so in South Vietnam at the present time.

Mr. McNamara's approval in June of the 1st Cavalry Division (Airmobile) as one of our regular 16

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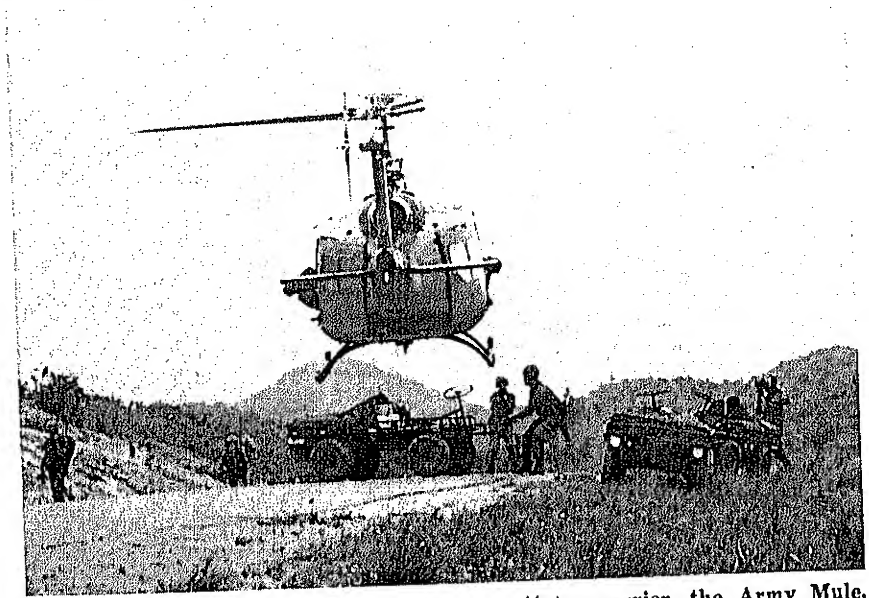

U. S. Army combat soldiers help remove a ½-ton carrier, the Army Mule, which was lifted up by a UH-1D helicopter.

The Planning and Management of the Navy RDT&E Program

Capt. B. H. Andrews, USN
Dir., Exploratory Development Division
Office of Naval Material

The Navy's Research, Development, Test and Evaluation (RDT&E) Program amounts to something in the order of one and one half billion dollars annually. It involves seven major Navy bureaus and offices, some two dozen major in-house Navy laboratories, several score more Navy field facilities and activities, and thousands of contractors, universities, consultants and other non-DOD resources.

Program Categories and Organizational Responsibilities.

The basic organization of the Navy Department is depicted on Chart 1. Each of the offices shown have certain responsibilities for parts of the Navy's RDT&E program.

The key office in this chain is the Assistant Secretary of the Navy for Research and Development—ASN (R&D). His charter is simple, direct and powerful:

> Establish policy, exercise management and control of, direct and supervise all Department of the Navy research, development, engineering, test and evaluation matters, including general management of the appropriation "Research, Developmnt, Test and Evaluation, Navy."

The ASN (R&D) is the only naval civilian executive assistant currently assigned as manager of an appropriation.

Chart 2 shows the principal offices through which the ASN(R&D) works.

A fundamental principle which governs the Navy RDT&E business is found in the user-producer relationship as it is set forth in the Navy General Order No. 5. In essence, the operational forces and components of the Navy and the Marine Corps are the users and all other activities are the producers.

It is the users' responsibility to state their requirements and to select the means of satisfying these requirements from the body of alternative proposals which may be offered by the producers.

It is the responsibility of the producers to formulate and to execute RDT&E programs which are responsive to the stated needs.

The operation of this user-producer relationship is best exemplified through a brief analysis of the program categories contained in DOD numbered program 6 (RDT&E):

6.1 Basic Research.
6.2 Exploratory Development.
6.3 Advanced Development.
6.4 Engineering Development.
6.5 Management and Support.

The coupling dialogue between users and producers varies from nearly zero to one hundred percent in this progression from research to systems hardware development. The degree of explicitness with which RDT&E effort can be related to operational requirements varies in the same fashion.

At one end of the spectrum lies basic research. The Naval Research Program seeks new knowledge which may be usefully exploited toward the solutions of future problems either known to exist or which are so far in the future as to be yet unvoiced and undefined. This program is formulated and prosecuted under the Chief of Naval Research (CNR). The relevance of the program content to the Navy's operational requirements is broadly implicit, and there is little direct influence exerted upon the program content by the user components. Naval Research accounts for approximately 10 percent of the Navy's total RDT&E effort.

Exploratory Development is a little farther along the chain. This program seeks to exploit research knowledge by the development of advanced techniques and by generally extending the state of the art in technologies across the board. Through this program is gained the technological know-how which stimulates the conceptual design of highly advanced systems and components. The Navy's Exploratory Development Program is formulated and prosecuted under the Chief of Naval Development (CND). The bulk of the program lies in the major producer complex called the Naval Military Support Establishment (NMSE), consisting of the four principal material bureaus with their laboratories and field activities, operating under the Chief of Naval Material (CNM). Exploratory Development accounts for 20–25 percent of the Navy's total RDT&E effort.

In distinct contrast to the Navy Research (6.1) and Exploratory Development (6.2) categories, the Advanced Development (6.3) and Engineering Development (6.4) programs are very specific hardware development programs pointed towards satisfying a specifically identified Navy operational requirement. These two programs are planned, funded and managed on a line item project basis. The user selects the work to be undertaken and evaluates the product from the standpoint of its military worth. The producer is charged with technical and business management of the effort. The differences between categories 6.3 and 6.4 projects lie mainly in the relative degrees of tech-

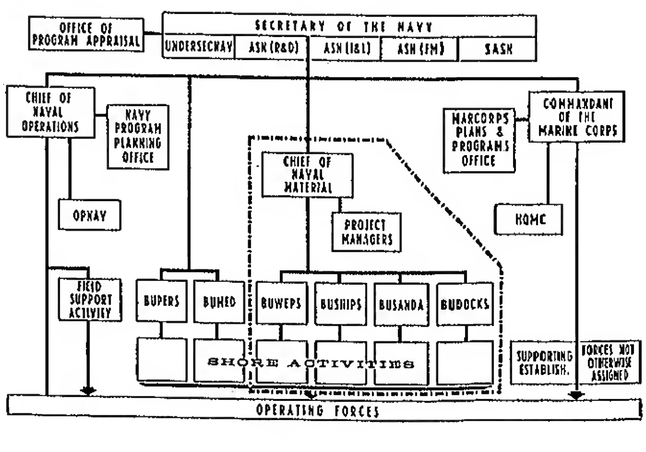

Chart 1.

nical risk, certainty as to military acceptability and implied commitment to subsequent procurement. The user-producer relationship is obviously quite close in these programs. Over 50 percent of the Navy total RDT&E funding is expended in these two categories of effort. The remaining category, Management and Support (6.5), covers general supporting items such as laboratory facilities, test ranges and the like.

Referring again to Chart 2, the responsibilities of the several offices reporting to ASN(R&D) are now clear:

• The Chief of Naval Research is his principal adviser with regard to the Naval Research Program.

• The Chief of Naval Department is his principal adviser with regard to the Exploratory Development Program.

• The Chief of Naval Operations and Commandant of the Marine Corps are his principal advisers with regard to the Advanced Development, Engineering Development and Operational Systems Development Programs.

The Planning Process.

The Navy RDT&E program planning process is part of a larger operation called the Navy Planning System. Although this is a formalized and intricate process, it has carefully provided for flexibility to meet changing circumstances quickly and effectively. Long range R&D planning is pointed not toward freezing future systems designs nto today's technologies, but rather toward advancing current technologies in directions that will provide the greatest range of options for future system design concepts.

There is a progressive series of documented planning steps which forms a two-way and continuous communications path between the users and the producers, and the anguage which is used progresses from quite broad to ery specific as one moves along this path from research o hardware development. Chart 3 depicts the general rocesses involved. This idealized chart does not, of course, how the constant interplay that goes on among all the evels and which makes the whole process a highly iterative ne, as indeed it is and must be.

Each of the documents referred to on Chart 3 has a well efined nature and purpose which need not be described ere except in a general sense.

Analysis of national objectives and national policy, DOD uidance, Joint Chiefs of Staff plans, Navy missions, etc., ads to a series of Navy planning documents which cover current, mid-range (up to 10 years) and long range (up to 20 years) Navy force levels and operational capabilities.

From these are developed General Operational Requirements (GOR's)—broad mission-oriented statements of required operational capabilities. These form the basic guidance for the Research and the Exploratory Development Programs. As basic knowledge and new techniques are acquired, various possible systems concepts take shape. The remainder of the planning process consists of a series of interchanges between the users and producers of proposals, analyses, tests, cost effectiveness evaluations, etc., culminating in final systems selection for prototype service testing and ultimate procurement.

Program Control.

The nature and degree of program control differs sharply with the program category.

Both Naval Research (Category 6.1) and Exploratory Development (Category 6.2) are essentially fund-level controlled programs. They represent a calculated policy decision to invest a certain portion of available RDT&E funds in broad scientific and technical work in order to develop what might be called a technological bank account against which the requirements of future systems concepts and designs may be pursued.

The principal aim of the Chief of Naval Research and the Chief of Naval Development in these program categories is maintaining, with limited resources, a sound balance of effort across the spectrum of potentially applicable fields.

This requires consideration of many factors, such as current and future operational requirements; assured capabilities and deficiencies; the relative urgencies and priorities of needs; an understanding of the sciences and techniques which are most likely to contribute solutions to existing or future problems; and many others. In addition, these programs must remain flexible and must not be permitted to stagnate. The ability to pursue new ideas and approaches must be preserved. If new work of promise is to be undertaken, it can only be accommodated by terminating other work of less promise, or by moving other work into a different category for further exploitation, as appropriate. However interesting and challenging a proposal may be from a scientific point of view, it is the

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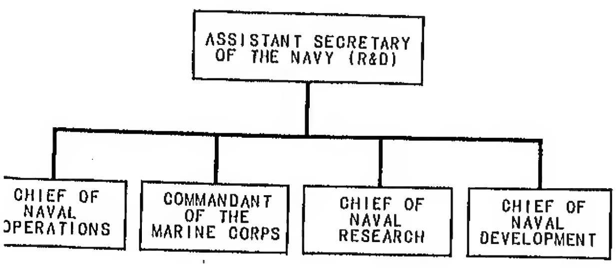

Chart 2.

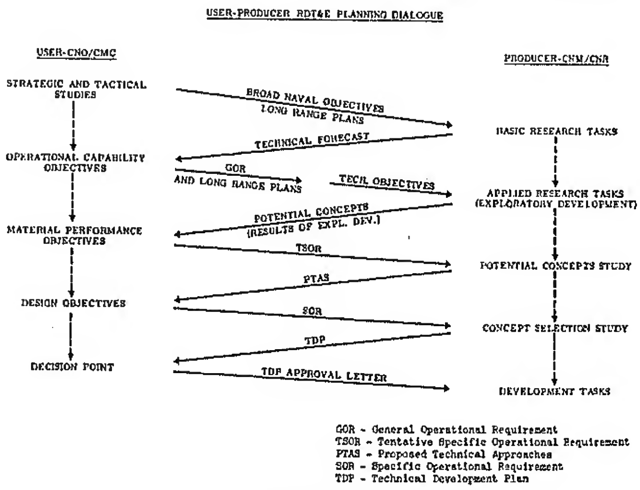

Chart 3.

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DOD Directive 5126.38, "Program of Contractor Performance Evaluation (Development and Production)," Dec. 3, 1965. Reissues DOD Directive 5126.38, dated Oct. 5, 1964, to broaden its scope in the development categories and to include certain production contracts which follow or are concurrent with the development contracts that are evaluated.

DOD Instruction 7700.4, "Reporting Requirements of the DOD Program of Contractor Performance Evaluation (Development and Production)," Dec. 7, 1965. Reissues DOD Instruction 7700.4, dated Aug. 8, 1963, to broaden its scope in the development categories and to include certain production contracts that follow or are concurrent with the development contracts that are evaluated.

> DOD directives and instructions may be obtained from:
> Publications Distribution Branch
> Office of the Secretary of Defense
> Room 3B 200, The Pentagon
> Washington, D. C. 20301

Defense Procurement Circular #37, Dec. 23, 1965. (1) Suspension of SUBPAR. (2) Small Purchase Procedures. (3) List of 100 Contractors Awarded the Largest Dollar Amount of Defense Prime Contracts.

Defense Procurement Circular #38, Jan. 10, 1966. (1) Labor Service Contracts. (2) DPC Notice Regarding 12-806.4(b).

> Each Defense Procurement Circular is designed to place new or changed policy or procedures in effect prior to publication of an Armed Services Procurement Regulation (ASPR) revision. ASPR subscribers will receive DPC's and ASPR revisions through the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402.

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Order AD-623 567 Electron Microscope Fracture Examination to Characterize and Identify Modes of Fracture. Naval Research Laboratory, Washington, D.C., Sept. 1965, 124 pp, $4.

Order AD-623 952 Feasibility Study of On-Site Fabricated Beach Matting. Boeing's Support Systems Div. for the Marine Corps., Sept. 1965, 78 pp, $3.

Order AD-622 780 Photoclastic Determination of Strain Distribution in Cement Paste, Mortars and Concrete. Naval Engineering Laboratory, Port Hueneme, Calif., Nov. 1965, 37 pp, $2.

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> Government research and development reports are available to science and industry at price indicated from:
> Clearinghouse for Federal and Scientific Information
> Department of Commerce
> Springfield, Va. 22151
> Authorized DOD contractors and grantees may obtain these documents without charge from:
> Defense Documentation Center
> Cameron Station
> Alexandria, Va. 22314

The Planning and Management of the Navy RDT&E Program
(*Continued from Page 23*)

potential applicability of the work to some Navy need that normally must prevail.

A continuing and careful program appraisal effort is obviously required to keep both of these programs healthy and most effectively responsive.

The control exercised over the hardware programs in the Advanced Development (Category 6.3) and Engineering Development (Category 6.4) is quite different.

Each year, the users (the Chief of Naval Operations and the Commandant of the Marine Corps) are offered many new ideas and concepts for systems which could be of operational value. Each of these is carefully studied with consideration as to priority, urgency, technical risk involved, potential military worth, implied costs and other commitments, and the like. The users then select the work to be undertaken within the funds which are expected to be available.

Each project thus selected becomes a separately budgeted and programmed line item.

Each of these projects is subject to continuous and detailed review of technical progress, cost, adherence to schedule, etc., and a monthly performance evaluation (MPE) report is submitted by the cognizant bureau to keep the user and the ASN(R&D) informed as to status and problems.

Program Execution.

The management which is given to RDT&E effort depends largely upon the nature, the magnitude and the relative importance to the Navy of the work involved.

Each of the in-house laboratories is provided with a reasonable amount of "foundational" money. These are funds from the Research (6.1) and the Exploratory Development (6.2) categories which are made available to the laboratory directors for work of their own selection. There is little or no direct management of these funds above the laboratory level except for post facto review of the quality and the results of the effort, and a minimal degree of guidance to avoid undesirable overlapping of work among the laboratories.

The remainder of the Naval Research (6.1) effort is prosecuted through the Office of Naval Research under the broad program guidance, supervision and fiscal control of the scientific offices of that organization. Much of this category of effort is conducted by universities and private industrial research organizations.

The remainder of the Exploratory Development (6.2) program is prosecuted through the several bureaus and offices under the coordination and control of the Chief of Naval Development. Most of this effort is prosecuted through the two major material bureaus (Bureau of Naval Weapons and Bureau of Ships) and the several established project offices of the NMSE, and is coordinated and directed by the Deputy Chief of Naval Material (Development) who exercises both program and fiscal control. Exploratory Development work is about evenly split between the in-house laboratories and industry.

Essentially all of the Systems Development effort (Categories 6.3 and 6.4) is prosecuted through the material bureaus of the NMSE and the various project offices under the broad policy control and technical supervision of the Chief of Naval Material. While a substantial systems development effort is prosecuted by the in-house Navy laboratories, the majority of such work is carried out through contracts to industrial organizations throughout the country.

This article could only hope to give a very simplified view of what is a most complex operation.

For those who would care to know more, complete information on this subject is contained in a two-volume series entitled "Department of the Navy RDT&E Management Guide (NAVSOP-2457)," available from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. The price is 60¢ for Volume I and $1.50 for Volume II.

Mobilization Designee Assignments Open In Army R&D

The Army Office of Research and Development is seeking applications to fill 86 mobilization designee assignment vacancies for grades ranging from major to colonel.

Active reserve officers will be considered on a selective basis in duty MOS 2167, Research and Development coordinator, and in MOS 2230, Psychologists.

The greatest demand is in the fields of nuclear physics, international affairs, life sciences, engineering, space physics, operations research, metallurgy, mathematics, chemistry, psychology, environmental sciences, budgeting and plans and programming. Credit is given for both military and civilian experience.

Mobilization designees have their training carefully monitored by the Office of the Chief of Research and Development (OCRD) to insure continuing career development. Duty may be within OCRD in the Pentagon, with R&D laboratories or by attendance or participation in Army R&D seminars. Arrangements for special R&D projects to earn retirement points may be made by those accepted officers who have scheduling difficulties.

Applications should be made on Department of the Army Form 2976 (Army Regulations 140–10 and 140–145) addressed to: Commanding Officer, U.S. Army Reserve Components Personnel Center, Fort Benjamin Harrison, Ind., through the appropriate U.S. Army Corps commander.

For those desiring assignment to the Office of the Chief of Research and Development, further information may be obtained by writing to the Office, Chief of Research and Development, Department of the Army, ATTN: Military Personnel Branch, Washington, D.C. 20310.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July-Nov. 1965	July-Nov. 1964
Procurement from All Firms	12,454,661	9,997,552
Procurement from Small Business Firms	2,622,872	2,068,883
Percent Small Business	21.1	20.7

Architects and Engineers Are Key to OCD Shelter Development Program

Architects and engineers exert the greatest single influence in the success of the Office of Civil Defense (OCD) Fallout Shelter Development Program. All buildings have shielded areas affording some degree of protection. This basic protection can be improved in future building construction without appreciably increasing the cost or adversely affecting the esthetics and function for normal use. Special knowledge is required to increase the lifesaving potential in new buildings—knowledge of the nature of radioactive fallout and how to design structure to provide shielding against it.

Because of its vital lifesaving potential, the development of a nationwide fallout shelter system is the core of civil defense planning. The aim is to achieve fallout shielding for all Americans through a network of dual-use public shelter space and by encouragement of private shelter development.

The vigorous construction program of the past few years and the continued expansion of this program throughout the United States offers an opportunity for a significant increase in America's fallout shelter inventory. The OCD Professional Development Program is designed to encourage such planning.

Architectural and engineering colleges and universities are playing an expanded role in disseminating the new technology of radiation shielding analysis and other related subjects to the design professions. Through this means, practicing professionals, as well as new graduates, can keep abreast of current developments.

With the cooperation of architectural and engineering educational institutions and their faculty members, a unique professional development program for practicing architects and engineers was initiated in 1961.

Fallout Shelter Analysis Courses are offered as intensive two-week sessions, on a semester type basis (one night a week for 15 weeks) or as a correspondence course. The courses acquaint architects and engineers with nuclear weapon effects and shielding methodology and design techniques. Architects and engineers who successfully complete the course are certified as Fallout Shelter Analysts and are periodically apprised of the latest developments including research reports.

Protective Construction Courses on a two-week or semester type basis are also offered. These courses are primarily concerned with structural dynamics and response of structures to the immediate effects of a nuclear detonation.

In addition, Environmental Engineering Courses are offered to acquaint the mechanical engineer with the unique problems associated with shelter environment control and the procedures for solving these problems. Other courses such as Disaster Engineering and Shelter Planning are now being developed for future presentation.

The immediate objective of this professional development program is to survey and locate potential public fallout shelter space in existing structures—a type of post-design analysis. But the program also provides the orientation that architects and engineers must have if fallout protection is to be considered at the critical point in the creation of a building—the design stage.

"Canine Corps" Seeks Recruits for Vietnam

Air Force sentry dog teams have performed so effectively in protecting American lives and preventing sabotage in South Vietnam that the quota has been doubled for canine recruits.

The 1,000-dog quota set in September has been raised to 2,000 to meet the increasing demand for sentry dog teams.

To qualify for duty in Vietnam, the dogs must be German shepherds only, male or spayed female, 12-36 months old, at least 23 inches high at the shoulder and weigh at least 60 pounds.

Anyone wishing to donate or sell German shepherd dogs is urged to write the USAF Animal Procurement Office, Lackland AFB, Tex. 78236.

Medical Research Labs Combine at WPAFB

The Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio, have merged their biophysics and biomedical laboratories. The new unit is called the Biophysics Laboratory.

The organizational switch was prompted, in part, by increasing emphasis on toxic hazards research and the resulting additions of tasks and employees. Toxicology work has been elevated to division status.

Realignment of the Aerospace Medical Research Laboratories reduces the number of laboratory units to two—the Biophysics Laboratory and the Behavior Science Laboratory, which remains unchanged.

During the past two years, space nutrition research has been diminishing at the Laboratories but the effort is being continued by the Aerospace Medical Division's School of Aerospace Medicine, Brooks AFB, Tex.

Other changes include establishment of a Life Support Division to bring together all related engineering and biological research.

No reduction in force was necessary in the change, and the Laboratories strength remains at 356 (227 civilians and 129 military personnel).

NORAD Excess ADP Equipment To Be Redistributed

An estimated $65 million worth of automatic data processing equipment left over after the reorganization of the North American Air Defense Command is slated for redistribution by the Department of Defense at no cost other than crating and shipping.

The excess equipment resulted from the phase out of certain semi-automatic ground environment (SAGE) facilities and will be made available to other DOD and Federal agencies.

Authorized donees will also be included in the redistribution of the equipment. Eligibility of authorized donees is determined by State agencies for surplus property and is contingent on support of education, public health or civil defense programs.

On-site operational inspections of the equipment will be held at Truax AFB, Wis., March 1, 2 and 3 and at Norton AFB, Calif., March 8, 9 and 10.

A catalog describing the equipment can be obtained from the Defense Supply Agency, Attention: DSAH–LSR, Cameron Station, Alexandria, Va 22314.

Department of Defense

FINANCIAL SUMMARY

(BILLIONS OF DOLLARS)

	FY 1961	FY 1962 Original	FY 1962 Final	FY 1963	FY 1964	FY 1965	FY 1966 Enacted & Auth.[a]	FY 1966 SEA Suppl.	FY 1966 Total	FY 1967
Strategic Offensive Forces	---	7.6	8.9	8.3	7.3	5.3	4.6	.5	5.1	5.1
Continental Air and Missile Defense Forces.	---	2.2	2.3	1.9	2.0	1.6	1.7	---	1.7	1.4
General Purpose Forces	---	14.5	17.5	17.5	17.7	19.0	21.2	8.8	30.0	25.7
Airlift/Sealift Forces	---	.9	1.2	1.3	1.2	1.5	1.7	.5	2.2	2.1
Reserve and Guard Forces	---	1.7	1.8	1.8	1.9	2.1	2.1	.1	2.2	2.4
Research and Development	---	3.9	4.2	5.1	5.4	4.9	5.2	.1	5.3	5.5
General Support	---	11.4	12.1	12.9	13.8	14.5	15.0	1.8	16.8	16.7
Retired Pay	---	.9	.9	1.0	1.2	1.4	1.6	---	1.6	1.8
Military Assistance	---	1.8	1.8	1.6	1.2	1.3	1.6	---	1.6	1.0
Total Obligational Authority	46.1	44.9	50.7	51.5	51.7	51.4	54.6	11.9	66.5	61.4
Less: Financing Adjustments	−3.0	−1.3	−1.3	−.4	−.8	−.9	−3.6	+.4	−3.2	−1.5
New Obligational Authority	43.1	43.7	49.4	51.1	50.9	50.5	51.0	12.3	63.3	59.9
Adjustment to Expenditures	+1.6	+1.0	−1.2	−1.1	+.3	−3.1	−.7	−8.4	−9.1	−1.6
Total Expenditures	44.7	44.7	48.2	50.0	51.2	47.4	50.3	3.9	54.2	58.3
TOA by Department and Agency										
Department of the Army	10.4	10.4	12.5	11.9	12.5	12.2	13.2	4.8	18.0	17.4
Department of the Navy	12.7	12.4	14.7	14.8	14.7	15.0	16.3	3.2	19.4	17.6
Department of the Air Force	19.9	18.5	19.7	20.5	20.2	19.6	19.7	3.7	23.4	21.5
Civil Defense	---	---	.3	.1	.1	.1	.1	---	.1	.1
Defense Agencies	.3	.4	.3	1.0	1.1	1.1	1.3	.2	1.6	1.5
Retired Pay	.8	.9	.9	1.0	1.2	1.4	1.6	---	1.6	[b]1.8
Defense Family Housing[c]	.5	.5	.5	.6	.7	.6	.7	---	.7	.5
Military Assistance	1.5	1.8	1.8	1.6	1.2	1.3	1.6	---	1.6	1.0
Total—TOA[d]	46.1	44.9	50.7	51.5	51.7	51.4	54.6	11.9	66.5	61.4
MEMO: Increases since FY 1961 in in rates of compensation included above:										
Increased Compensation Rate:										
Military	---	---	---	.1	1.1	1.6	2.4	---	2.4	2.5
Civilian	---	---	---	.2	.3	.6	.7	---	.7	.8
Increased Payments to Retired Personnel.	---	.1	.1	.2	.4	.6	.8	---	.8	1.0
Total	---	.1	.1	.5	1.8	2.8	3.9	---	3.9	4.3
Unfunded military retirement past service liability.	45.1	---	47.3	48.9	56.1	58.3	66.5	---	66.5	69.2

[a] Included is authority granted by August 1965 Amendment (i.e., $1.7 billion for Southeast Asia) plus $.9 billion for increased personnel compensation.

[b] At current pay rates, it would require $2.1 billion in FY 1967 to fund "current service costs."

[c] In 1961 and 1962 funds for this activity were appropriated to the military departments.

[d] Excludes cost of nuclear warheads.

Department of Defense

Direct Budget Plan (TOA), New Obligational Authority, Direct Obligations and Expenditures Fiscal Years 1965-1967

(MILLIONS OF DOLLARS)

	Direct Budget Plan (TOA)			New Obligational Authority			Direct Obligations			Expenditures		
	FY 1965	FY 1966	FY 1967	FY 1965	FY 1966	FY 1967	FY 1965	FY 1966	FY 1967	FY 1965	FY 1966	FY 1967
Functional Classification												
Military Personnel												
Active Forces	12,698	14,552	16,016	12,506	14,522	16,016	12,698	14,552	16,016	12,662	14,250	15,560
Reserve Forces	732	860	880	751	860	880	732	860	880	725	770	840
Retired Pay	1,386	1,600	1,780	1,399	1,600	1,780	1,386	1,600	1,780	1,384	1,580	1,750
Total	14,816	17,011	18,676	[a]14,656	[a]16,981	18,676	14,816	17,011	18,676	14,771	16,600	18,150
Operation and Maintenance	12,563	14,911	15,700	12,603	14,911	15,700	12,563	14,911	15,700	12,349	14,160	14,980
Procurement	14,423	22,676	17,834	13,836	19,881	16,408	13,483	20,603	18,474	11,839	13,880	15,970
Research, Development, Test, and Evaluation	6,527	6,946	6,914	6,483	6,791	6,905	6,387	7,011	6,893	6,236	6,370	6,400
Military Construction	988	2,528	612	1,049	2,500	593	1,051	1,924	1,327	1,007	1,140	1,120
Family Housing	650	694	527	631	666	522	662	624	684	619	650	545
Civil Defense	102	107	134	105	107	133	95	118	145	93	100	100
Revolving and Management Funds	------	------	------	------	------	------	------	------	------	−741	25	−115
Total, Military Functions	50,069	64,874	60,397	49,363	61,838	58,938	49,057	62,203	61,900	46,173	52,925	57,150
Military Assistance	1,326	1,591	1,027	1,130	1,470	917	1,167	1,478	917	1,229	1,275	1,150
Total, Mil. Functions and Mil. Assistance	51,394	66,465	61,424	50,493	63,308	59,855	50,224	63,681	62,817	47,401	54,200	58,300
Department or Agency												
Department of the Army	12,234	18,034	17,376	12,003	17,075	17,116	12,172	17,453	17,713	11,600	14,024	16,518
Department of the Navy	14,982	19,428	17,579	14,845	18,383	16,952	14,622	18,768	17,765	13,399	15,461	17,055
Department of the Air Force	19,607	23,449	21,498	19,219	22,477	20,942	19,007	22,146	22,204	18,216	19,766	19,809
Defense Agencies/OSD	3,145	3,856	3,809	3,192	3,796	3,794	3,161	3,719	4,072	2,865	3,574	3,668
Civil Defense	102	107	134	105	107	133	95	118	145	93	100	100
Total, Military Functions	50,069	64,874	60,397	49,363	61,838	58,938	49,057	62,203	61,900	46,173	52,925	57,150
Military Assistance	1,326	1,591	1,027	1,130	1,470	917	1,167	1,481	917	1,229	1,275	1,150
Total, Mil. Functions and Mil. Assistance	51,394	66,465	61,424	50,493	63,308	59,855	50,224	63,684	62,817	47,401	54,200	58,300

NOTE: FY 1966 NOA includes amounts proposed for separate transmittal: $12,345,710,000 for Vietnamese Special Support: $761,100,000 for military pay increase; and $102,421,000 for civilain pay increase.

[a] In addition, transfers from working capital funds: FY 1965, $193,300,000; FY 1966, $30,000,000.

OASD (Comptroller)
FAD–524
January 24, 1966

Department of Defense

Direct Budget Plan (TOA), New Obligational Authority, Direct Obligations and Expenditures Fiscal Year 1967—By Functional Title and Service

(MILLIONS OF DOLLARS)

Functional Classification	Direct Budget Plan (TOA)					New Obligational Authority					Direct Obligations					Expenditures				
	Total	Army	Navy	Air Force	[illegible]	Total	Army	Navy	Air Force	[illegible]	Total	Army	Navy	Air Force	[illegible]	Total	Army	Navy	Air Force	[illegible]
MILITARY PERSONNEL																				
Active Forces	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Reserve Forces	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Retired Pay	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OPERATION AND MAINTENANCE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PROCUREMENT																				
Aircraft	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Missiles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ships	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tracked Combat Vehicles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ordnance, Vehicles, and Related Equipment	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Electronics and Communications	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other Procurement	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RESEARCH, DEVELOPMENT, TEST, AND EVALUATION																				
Military Sciences	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aircraft	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Missiles	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Astronautics	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ships	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ordnance, Vehicles, and Related Equipment	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other Equipment	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Programwide Management and Support	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Emergency Fund	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MILITARY CONSTRUCTION																				
Active Forces	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Reserve Forces	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
FAMILY HOUSING	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CIVIL DEFENSE	[illegible]				[illegible]	[illegible]				[illegible]	[illegible]				[illegible]	[illegible]				[illegible]
REVOLVING AND MANAGEMENT FUNDS										[illegible]	[illegible]				[illegible]	[illegible]				[illegible]
TOTAL—MILITARY FUNCTIONS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
MILITARY ASSISTANCE	[illegible]					[illegible]					[illegible]					[illegible]				
TOTAL—MIL. FUNCTIONS & MIL. ASSISTANCE	[illegible]					[illegible]					[illegible]					[illegible]				

OASD Comptroller
FAD-[illegible]
January [illegible], 19[illegible]

Department of Defense—Military Functions
Procurement FY 1965 - 1967
(MILLIONS OF DOLLARS)

Functional Classification	Direct Budget Plan (TOA) FY 1965	FY 1966	FY 1967	New Obligational Authority FY 1965	FY 1966	FY 1967	Direct Obligations FY 1965	FY 1966	FY 1967	Expenditures FY 1965	FY 1966	FY 1967
AIRCRAFT												
Army	395	1,333	592	451	1,311	592	406	1,237	685	346	299	854
Navy	2,063	3,224	1,612	1,888	2,791	1,422	1,931	2,835	1,893	1,739	1,801	2,163
Air Force	3,971	5,596	4,355	3,623	5,261	3,961	3,554	4,721	4,696	3,115	3,900	3,700
Total	6,429	10,153	6,560	5,962	9,363	5,976	5,891	8,793	7,274	5,200	6,000	6,717
MISSILES												
Army	243	369	356	234	341	356	209	329	334	254	118	224
Navy	565	424	385	666	427	385	514	417	395	521	544	472
Air Force	1,614	1,243	1,240	1,715	840	1,190	1,352	1,200	1,211	1,320	1,210	1,055
Total	2,422	2,036	1,981	2,615	1,608	1,931	2,075	1,946	1,939	2,096	1,872	1,751
SHIPS—Navy	1,815	1,930	2,041	1,905	1,590	1,751	1,905	1,770	1,907	1,713	1,650	1,700
TRACKED COMBAT VEHICLES												
Army	203	376	359	203	292	359	201	372	351	198	179	277
Navy	8	13	4	8	13	4	3	14	4	38	10	10
Total	211	389	363	211	306	363	204	386	355	236	189	287
ORDNANCE, VEHICLES, AND RELATED EQUIPMENT												
Army	718	2,031	1,648	563	1,564	1,448	727	1,892	1,650	470	1,126	1,162
Navy	571	1,628	1,370	533	1,500	1,301	501	1,584	1,340	369	640	1,231
Air Force	404	1,445	1,545	335	1,370	1,469	403	1,298	1,614	233	348	1,009
Defense Agencies/OSD	1	2	1	1	2	1	1	2	1	1	2	1
Total	1,693	5,105	4,564	1,431	4,436	4,218	1,632	4,776	4,606	1,073	2,117	3,403
ELECTRONICS AND COMMUNICATIONS												
Army	206	450	293	178	334	268	300	447	301	277	312	360
Navy	399	470	417	427	406	369	349	495	432	280	294	353
Air Force	438	447	225	419	424	214	415	399	273	329	387	313
Defense Agencies/OSD	13	10	28	16	4	28	8	11	27	11	9	21
Total	1,055	1,377	963	1,039	1,167	879	1,072	1,351	1,034	897	1,001	1,048
OTHER PROCUREMENT												
Army	210	487	312	154	332	288	160	451	295	219	236	343
Navy	416	738	564	351	657	540	386	726	540	273	381	396
Air Force	141	434	463	121	412	439	141	375	500	103	410	308
Defense Agencies/OSD	29	26	24	46	9	22	18	29	23	31	24	18
Total	797	1,685	1,363	672	1,411	1,289	704	1,581	1,358	625	1,051	1,064
TOTAL—PROCUREMENT												
Army	1,974	5,045	3,561	1,783	4,174	3,311	2,002	4,728	3,616	1,764	2,270	3,220
Navy	5,837	8,428	6,392	5,778	7,385	5,772	5,589	7,841	6,511	4,933	5,320	6,325
Air Force	6,568	9,165	7,827	6,213	8,307	7,273	5,865	7,992	8,295	5,101	6,255	6,385
Defense Agencies/OSD	43	37	54	62	15	51	27	42	52	42	35	40
TOTAL	14,423	22,676	17,834	13,836	19,881	16,408	13,483	20,603	18,474	11,839	13,880	15,970

OASD (Comptroller)
January 24, 1966
FAD-526

Department of Defense—Military Functions
Research, Development, Test, and Evaluation FY 1965 - 1967
(MILLIONS OF DOLLARS)

Functional Classification	Direct Budget Plan (TOA) FY 1965	FY 1966	FY 1967	New Obligational Authority FY 1965	FY 1966	FY 1967	Direct Obligations FY 1965	FY 1966	FY 1967	Expenditures FY 1965	FY 1966	FY 1967
MILITARY SCIENCES												
Army	168	160	162	160	156	162	173	160	159	167	147	152
Navy	183	186	192	178	181	192	188	186	185	176	183	185
Air Force	161	159	164	130	158	164	159	152	163	144	143	152
Defense Agencies/OSD	108	103	107	108	103	107	100	109	109	86	98	104
Total	621	608	625	577	598	625	620	607	616	573	572	592
AIRCRAFT												
Army	75	105	93	70	100	93	69	100	90	69	90	86
Navy	251	286	246	248	276	246	222	294	238	223	231	245
Air Force	803	796	678	738	720	678	801	815	697	722	758	691
Defense Agencies/OSD	7	17	12	7	7	12	3	17	12	3	16	11
Total	1,136	1,205	1,028	1,063	1,103	1,028	1,095	1,226	1,037	1,017	1,094	1,034
MISSILES												
Army	660	681	719	629	646	719	631	670	721	578	636	674
Navy	386	398	665	378	389	665	390	404	643	378	394	488
Air Force	801	799	830	797	788	830	802	764	831	831	712	788
Defense Agencies/OSD	130	120	119	131	120	119	132	126	120	114	114	113
Total	1,977	1,998	2,334	1,935	1,942	2,334	1,955	1,964	2,315	1,901	1,855	2,063
ASTRONAUTICS												
Army	15	23	13	15	2	13	21	22	13	21	22	13
Navy	28	21	13	34	24	13	24	22	12	24	24	16
Air Force	862	988	814	837	987	814	848	1,000	824	873	932	803
Defense Agencies/OSD	3	4	4	3	4	4	4	4	4	3	3	3
Total	908	1,036	843	889	1,017	843	897	1,048	853	921	981	835
SHIPS												
Army	1	2	1	1	2	1	1	1	1	------	1	------
Navy	285	330	281	280	348	281	256	338	270	249	281	309
Total	286	331	282	281	350	282	257	340	271	249	282	309
ORDNANCE, VEHICLES, AND RELATED EQUIPMENT												
Army	205	201	187	191	190	187	203	201	187	203	188	175
Navy	155	190	178	148	184	178	137	195	172	126	152	171
Defense Agencies/OSD	1	1	2	1	1	2	2	1	2	1	1	1
Total	361	393	367	341	376	367	342	397	360	330	340	347
OTHER EQUIPMENT												
Army	228	258	267	264	291	267	225	273	272	222	243	261
Navy	67	80	87	58	88	87	62	84	84	52	69	76
Air Force	248	312	289	282	303	289	214	336	292	193	315	284
Defense Agencies/OSD	242	243	214	244	246	205	274	253	218	237	228	207
Total	785	893	857	848	928	848	775	945	865	704	855	829
PROGRAMWIDE MANAGEMENT AND SUPPORT												
Army	72	74	78	72	75	78	71	75	78	85	73	74
Navy	68	78	86	63	76	86	61	78	86	65	68	75
Air Force	302	301	278	391	297	278	304	300	277	384	240	222
Defense Agencies/OSD	11	11	11	11	11	11	10	11	11	9	10	10
Total	454	464	453	536	458	453	447	465	451	542	391	381
EMERGENCY FUND												
Defense Agencies/OSD	------	19	125	12	19	125	------	19	125	------	------	10
TOTAL—RESEARCH, DEVELOPMENT, TEST, AND EVALUATION												
Army	1,425	1,504	1,519	1,402	1,462	1,519	1,393	1,502	1,520	1,344	1,400	1,435
Navy	1,423	1,569	1,749	1,388	1,566	1,749	1,341	1,602	1,690	1,294	1,400	1,565
Air Force	3,176	3,355	3,054	3,175	3,253	3,054	3,128	3,366	3,084	3,146	3,100	2,940
Defense Agencies/OSD	503	518	593	518	511	584	525	541	600	452	470	460
TOTAL	6,527	6,946	6,914	6,483	6,791	6,905	6,387	7,011	6,893	6,236	6,370	6,400

OASD (Comptroller)
FAD–527
January 24, 1966

Department of Defense

Estimated Obligations and Amounts Available for Obligation

General Fund Appropriations—FY 1965-1967

(IN THOUSANDS)

	Unobligated balance brought forward	New obligational authority	Transfers of prior year balances	Reimburse-ments	Total available for obligation	Obligations incurred	Unobligated balance expiring for obligation	Unobligated balance carried forward
FISCAL YEAR 1965—ACTUAL								
Department of the Army	2,362,398	12,003,016	48,800	1,991,989	16,406,202	13,999,359	18,895	2,387,949
Department of the Navy	4,662,535	14,844,723	63,500	1,208,113	20,778,871	15,629,654	21,963	5,127,254
Department of the Air Force	2,633,812	19,218,817	81,000	1,317,766	23,251,394	20,036,416	1,182	3,213,796
Defense Agencies/OSD	285,488	3,191,728	------	259,795	3,737,011	3,413,437	46,842	276,732
Civil Defense	16,426	105,185	------	510	122,121	94,983	3,682	23,456
Total—Military Functions	9,960,659	49,363,468	193,300	4,778,172	64,295,599	53,173,849	92,564	11,029,187
Military Assistance [a]	4,398	1,130,000	55,000	7,996	1,197,394	1,174,746	493	22,155
Total—Mil. Functions & Mil. Assist.	9,965,057	50,493,468	248,300	4,786,168	65,492,993	54,348,595	93,057	11,051,341
FISCAL YEAR 1966—ESTIMATED								
Department of the Army	2,387,949	17,075,339	30,000	3,095,540	22,588,829	20,551,430	------	2,037,399
Department of the Navy	5,127,254	18,383,484	------	1,239,226	24,749,964	19,746,241	------	5,003,724
Department of the Air Force	3,213,796	22,476,651	------	1,355,621	27,046,068	23,378,034	------	3,668,033
Defense Agencies/OSD	276,732	3,795,935	------	60,543	4,133,210	3,772,636	------	360,573
Civil Defense	23,456	106,766	------	195	130,417	118,667	------	11,750
Total—Military Functions	11,029,187	61,838,174	30,000	5,751,125	78,648,488	67,567,009	------	11,081,479
Military Assistance [a]	22,155	1,470,000	−873	------	1,491,282	1,481,282	------	10,000
Total—Mil. Functions & Mil. Assist.	11,051,341	63,308,174	29,127	5,751,125	80,139,770	69,048,291	------	11,091,479
FISCAL YEAR 1967—ESTIMATED								
Department of the Army	2,037,399	17,116,394	------	2,870,631	22,024,424	20,403,739	------	1,620,685
Department of the Navy	5,003,724	16,952,200	------	1,074,559	23,030,483	18,879,429	------	4,151,054
Department of the Air Force	3,668,033	20,942,200	------	1,237,419	25,847,652	23,304,349	------	2,543,303
Defense Agencies/OSD	360,573	3,793,506	------	66,053	4,220,132	4,126,190	------	93,942
Civil Defense	11,750	133,400	1,000	195	146,345	145,675	------	670
Total—Military Functions	11,081,479	58,937,700	1,000	5,248,857	75,269,036	66,859,382	------	8,409,654
Military Assistance [a]	10,000	917,000	------	------	927,000	917,000	------	10,000
Total—Mil. Functions & Mil. Assist.	11,091,479	59,854,700	1,000	5,248,857	76,196,036	67,776,382	------	8,419,654

[a] Consistent with the Budget Document presentation. Military Assistance orders (reservations) placed with the military departments are treated in the same manner as obligations.

OASD (Comptroller)
FAD-528
January 24, 1966

Department of Defense

Estimated Expenditures and Amounts Available for Expenditure

Fiscal Years 1965 - 1967

(IN THOUSANDS)

	Unexpended balance brought forward	New obligational authority	Transfers of prior year balances	Total available for expenditure	Expenditures	Balances withdrawn (-) or restored	Unexpended balance carried forward
FISCAL YEAR 1965—ACTUAL							
Department of the Army	5,866,008	12,003,016	13,800	17,882,824	11,600,358	—87,661	6,194,805
Department of the Navy	14,143,303	14,844,723	63,500	29,051,526	13,398,874	—37,592	15,615,060
Department of the Air Force	8,688,182	19,218,817	40,000	27,946,998	18,216,010	—18,786	9,712,203
Defense Agencies/OSD	1,209,640	3,191,728	—117,300	4,284,068	2,864,909	—55,147	1,364,012
Civil Defense	113,903	105,185	------	219,088	92,718	—22,185	104,185
Total—Military Functions	30,021,036	49,363,468	------	79,384,504	46,172,869	—221,371	32,990,264
Military Assistance	1,993,509	1,130,000	55,000	3,178,509	1,228,579	—493	1,949,437
Total—Mil. Functions & Mil. Assist.	32,014,545	50,493,468	55,000	82,563,013	47,401,449	—221,864	34,939,700
FISCAL YEAR 1966—ESTIMATED							
Department of the Army	6,194,805	17,075,339	------	23,270,144	14,024,438	12,300	9,258,006
Department of the Navy	15,615,060	18,383,484	------	33,998,544	15,461,350	8,600	18,545,794
Department of the Air Force	9,712,203	22,476,651	------	32,188,853	19,765,532	45,800	12,469,121
Defense Agencies/OSD	1,364,012	3,795,935	------	5,159,947	3,573,680	------	1,586,267
Civil Defense	104,185	106,766	------	210,951	100,000	------	110,951
Total—Military Functions	32,990,264	61,838,174	------	94,828,438	52,925,000	66,700	41,970,138
Military Assistance	1,949,437	1,470,000	------	3,419,437	1,275,000	------	2,144,437
Total—Mil. Functions & Mil. Assist.	34,939,700	63,308,174	------	98,247,874	54,200,000	66,700	44,114,574
FISCAL YEAR 1967—ESTIMATED							
Department of the Army	9,258,006	17,116,394	------	26,374,400	16,518,415	------	9,855,985
Department of the Navy	18,545,794	16,952,200	------	35,497,994	17,054,615	------	18,443,379
Department of the Air Force	12,469,121	20,942,200	------	33,411,321	19,809,025	------	13,602,296
Defense Agencies/OSD	1,586,267	3,793,506	------	5,379,773	3,667,945	------	1,711,828
Civil Defense	110,951	133,400	------	244,351	100,000	------	144,351
Total—Military Functions	41,970,138	58,937,700	------	100,907,838	57,150,000	------	43,757,838
Military Assistance	2,144,437	917,000	------	3,061,437	1,150,000	------	1,911,437
Total—Mil. Functions & Mil. Assist.	44,144,574	59,854,700	------	103,969,274	58,300,000	------	45,669,274

OASD (Comptroller)
FAD-529
January 24, 1966

Department of Defense

Order of Magnitude Data on Comparative Expenditures By Functional Title As If FY 1967 Budget Structure Had Been Adopted Circa 1948 FY 1954-1967

(MILLIONS OF DOLLARS)

Functional Classification	FY 1954	FY 1955	FY 1956	FY 1957	FY 1958	FY 1959	FY 1960	FY 1961	FY 1962	FY 1963	FY 1964	FY 1965	FY 1966	FY 1967
Military Personnel														
Active Forces	10,963	10,643	10,665	10,384	10,441	10,545	10,390	10,651	11,530	11,386	12,312	12,662	14,250	15,560
Reserve Forces	293	341	439	514	608	615	654	648	607	599	674	725	770	840
Retired Pay	386	419	477	511	562	641	694	786	894	1,015	1,209	1,384	1,580	1,750
Total	11,643	11,403	11,582	11,409	11,611	11,801	11,738	12,085	13,032	13,000	14,195	14,771	16,600	18,150
Operation and Maintenance	9,162	7,931	8,400	9,487	9,761	10,378	10,223	10,611	11,594	11,874	11,932	12,349	14,160	14,980
Procurement														
Aircraft	9,080	8,804	7,835	8,647	8,793	7,730	6,272	5,898	6,400	6,309	6,053	5,200	6,000	6,717
Missiles	417	604	1,005	1,855	2,434	3,337	3,027	2,972	3,442	3,817	3,577	2,096	1,872	1,751
Ships	905	944	858	842	1,105	1,491	1,744	1,801	1,906	2,522	2,078	1,713	1,650	1,700
Tracked Combat Vehicles	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	236	189	287
Ordnance, Vehicles, and Related Equipment	3,334	1,191	1,260	674	365	399	443	675	1,137	1,665	1,597	1,073	2,117	3,403
Electronics and Communications	700	441	660	704	663	720	1,093	1,042	1,139	1,427	1,264	897	1,001	1,048
Other Procurement	1,521	854	608	767	723	730	755	706	507	891	782	625	1,051	1,064
Total	15,957	12,838	12,227	13,488	14,083	14,409	13,334	13,095	14,532	16,632	15,351	11,839	13,880	15,970
Research, Development, Test, and Evaluation	2,187	2,261	2,101	2,406	2,504	2,866	4,710	6,131	6,319	6,376	7,021	6,236	6,370	6,400
Military Construction	1,744	1,715	2,079	1,968	1,753	1,948	1,626	1,605	1,347	1,144	1,026	1,007	1,140	1,120
Family Housing	-----	-----	-----	-----	-----	-----	-----	-----	-----	427	580	619	650	545
Civil Defense	-3	*	*	-1	*	*	*	*	90	203	107	93	100	100
Revolving and Management Funds	-219	-611	-684	-323	-643	-179	-416	-300	-99	-1,401	-452	-741	25	-115
Adjustment to Budget Basis	-145	-6	86	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total—Military Functions	40,326	35,531	35,792	38,436	39,070	41,223	41,215	43,227	46,815	48,252	49,760	46,173	52,925	57,150
Military Assistance	3,629	2,292	2,611	2,352	2,187	2,340	1,609	1,449	1,390	1,721	1,485	1,229	1,275	1,150
Total—Military Functions & Military Assistance	43,955	37,823	38,403	40,788	41,258	43,563	42,824	44,676	48,205	49,973	51,245	47,401	54,200	58,300
Department or Agency														
Department of the Army	12,910	8,901	8,703	9,063	9,051	9,467	9,392	10,130	11,427	11,499	12,050	11,600	14,024	16,518
Department of the Navy	11,290	9,732	9,744	10,397	10,913	11,720	11,642	12,214	13,260	14,005	14,520	13,399	15,461	17,055
Department of the Air Force	15,666	16,405	16,750	18,261	18,437	19,083	19,065	19,785	20,840	20,642	20,509	18,216	19,766	19,809
Defense Agencies/OSD	464	494	596	615	669	953	1,115	1,098	1,198	1,905	2,574	2,865	3,574	3,668
Civil Defense	-3	*	*	-1	*	*	*	*	90	203	107	93	100	100
Total—Military Functions	40,326	35,531	35,792	38,436	39,070	41,223	41,215	43,227	46,815	48,252	49,760	46,173	52,925	57,150
Military Assistance	3,629	2,292	2,611	2,352	2,187	2,340	1,609	1,449	1,390	1,721	1,485	1,229	1,275	1,150
Total—Military Functions & Military Assistance	43,955	37,823	38,403	40,788	41,258	43,563	42,824	44,676	48,205	49,973	51,245	47,401	54,200	58,300

NOTE: Amounts include estimated comparability adjustments not supportable by accounting records.
* Less than $.5 million.
a Amount included in entry for "Ordnance, Vehicles, and Related Equipment."

OASD (Comptroller)
FAD-397
January 24, 1966

Department of Defense

Order of Magnitude Data on Comparative New Obligational Authority By Functional Title As If FY 1967 Budget Structure Had Been Adopted Circa 1948 FY 1954 - 1967

(MILLIONS OF DOLLARS)

Functional Classification	FY 1954	FY 1955	FY 1956	FY 1957	FY 1958	FY 1959	FY 1960	FY 1961	FY 1962	FY 1963	FY 1964	FY 1965	FY 1966	FY 1967
Military Personnel														
Active Forces	11,266	10,650	10,526	10,411	10,398	10,709	10,637	10,695	11,545	11,431	12,273	12,699	14,552	16,016
Reserve Forces	315	369	512	613	607	644	674	660	633	672	703	751	860	880
Retired Pay	387	424	495	515	567	640	715	790	920	1,026	1,228	1,399	1,600	1,780
Total	11,968	11,442	11,534	11,539	11,572	11,993	12,026	12,144	13,098	13,129	14,204	14,849	17,011	18,676
Operation and Maintenance	9,462	8,276	8,768	9,734	10,221	10,187	10,317	10,702	11,759	11,496	11,705	12,603	14,911	15,700
Procurement														
Aircraft	5,041	4,922	6,923	6,559	5,945	6,167	5,929	4,998	5,646	5,882	5,640	5,962	9,363	5,976
Missiles	569	234	764	2,135	2,090	3,966	2,030	2,078	3,230	3,969	3,676	2,615	1,608	1,931
Ships	759	1,150	1,274	1,335	1,723	1,943	1,140	2,246	2,967	2,939	2,060	1,905	1,590	1,751
Tracked Combat Vehicles	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	211	306	363
Ordnance, Vehicles, and Related Equipment	2,990	527	405	247	90	545	703	1,034	1,830	1,959	2,028	1,431	4,436	4,218
Electronics and Communications	395	327	215	469	549	982	1,179	935	1,375	1,176	1,353	1,039	1,167	879
Other Procurement	835	260	214	549	586	701	720	425	697	742	889	672	1,411	1,289
Total	10,588	7,420	9,795	11,294	10,983	14,304	11,701	11,716	15,746	16,667	15,645	13,836	19,881	16,408
Research, Development, Test, and Evaluation	2,165	1,708	1,828	2,185	2,345	3,777	5,620	6,033	6,402	6,993	6,984	6,483	6,791	6,905
Military Construction	308	882	2,012	1,915	2,085	1,385	1,364	1,061	972	1,204	949	1,049	2,500	593
Family Housing	-----	-----	-----	-----	-----	-----	-----	-----	-----	590	644	631	666	522
Civil Defense	-----	-----	-----	-----	-----	-----	-----	-----	257	126	112	105	107	133
Revolving and Management Funds	100	1,119	-----	75	130	57	30	30	(b)	(b)	-----	-----	-----	-----
Subtotal—Military Functions—New Obligational Avail.	34,590	30,847	33,937	36,742	37,337	41,703	41,058	41,686	48,234	50,204	50,243	49,557	61,868	58,938
Transfers from prior year balances	-----	−60	−750	−487	−590	−535	−430	−366	−388	−410	−321	−193	−30	-----
Total—Military Functions—New Obligational Authority	34,590	30,787	33,187	36,255	36,747	41,168	40,628	41,321	47,846	49,794	49,922	49,363	61,838	58,938
Military Assistance	3,762	1,204	1,016	2,018	1,340	1,515	1,331	1,785	1,577	1,325	1,000	1,130	1,470	917
Total—Military Functions & Military Assistance	38,352	31,991	34,203	38,273	38,087	42,683	41,959	43,106	49,423	51,119	50,922	50,493	63,308	59,855
Department or Agency														
Department of the Army	12,777	7,764	7,354	7,672	7,731	9,381	9,689	9,914	12,141	11,631	12,513	12,003	17,075	17,116
Department of the Navy	9,612	10,221	9,648	10,220	10,506	11,820	11,270	12,431	14,757	15,286	14,899	14,845	18,383	16,952
Department of the Air Force	11,411	12,137	15,517	17,697	17,732	18,713	18,496	17,884	19,513	20,179	19,446	19,219	22,477	20,942
Defense Agencies/OSD	791	666	667	666	777	1,255	1,173	1,092	1,178	2,572	2,951	3,192	3,796	3,794
Civil Defense	-----	-----	-----	-----	-----	-----	-----	-----	257	126	112	105	107	133
Total—Military Functions	34,590	30,787	33,187	36,255	36,747	41,168	40,628	41,321	47,846	49,794	49,922	49,363	61,838	58,938
Military Assistance	3,762	1,204	1,016	2,018	1,340	1,515	1,331	1,785	1,577	1,325	1,000	1,130	1,470	917
Total—Military Functions & Military Assistance	38,352	31,991	34,203	38,273	38,087	42,683	41,959	43,106	49,423	51,119	50,922	50,493	63,308	59,855

NOTE: Amounts include estimated comparability adjustments not supportable by accounting records.

[a] Amount included in entry for "Ordnance Vehicles and Related Equipment."

[b] Excludes authority in Stock Funds (10 U.S.C. 2210(b)) to incur reimbursable obligations in anticipation of reimbursable orders to be received in subsequent years. Such authority is included in the Budget Document presentation as "New Obligational Authority."

OASD (Comptroller)
FAD-396
January 24, 1966

Department of Defense

Estimated Expenditures for Vietnamese Special Support
Fiscal Years 1966 and 1967

(MILLIONS OF DOLLARS)

	FY 1966	FY 1967
Military Personnel	1,140	2,494
Operation and Maintenance	1,898	2,854
Procurement	1,307	4,447
Research, Development, Test, and Evaluation	30	80
Military Construction	260	460
Total	4,635	10,335

NOTE: Amounts include expenditures from the $1.7 billion FY 1966 Amendment, and the $0.7 billion FY 1965 Supplemental.

New Labor Dept. Standards Used in DOD Labor Surplus Area Programs

New criteria for labor surplus areas conforming to those contained in the Public Works and Economic Development Act of 1965 (PL 89–136) have been incorporated in the Department of Labor "Area Trends in Employment and Unemployment" used by Defense Department procurement and small business/economic utilization specialists in making labor surplus area determinations.

Labor surplus area procurement actions are affected by the following changes:

• An effective date (Dec. 15) in the case of the October-November issue of the Department of Labor "Area Trends" is now set forth in the publication for use in procurement and will be in each subsequent issue giving three weeks lead-time for new listings.

• A shift from a monthly to an annual review of "persistent" labor surplus areas, i.e., those areas which have had a substantial unemployment rate of six percent or more, and which were either 50 percent above the national average for three of four preceding calendar years, or 75 percent for two of three preceding calendar years, or 100 percent above the national average for one of the two preceding calendar years.

• The classification of certain cities of 250,000 or more as "persistent" labor surplus areas, started in June 1964, will continue providing they meet certain Departments of Labor and Commerce criteria for such categories. Cities listed as "persistent" labor surplus areas are Oakland and San Diego, Calif.; Miami, Fla.; Newark, N.J.; and Philadelphia and Pittsburgh, Pa.

• Under the revised criteria all "persistent" and "substantial" areas are eligible for preferences in Federal procurement (in the form of partial set-asides in DOD). All persistent areas are eligible for benefits, including grants under all titles of the Public Works and Economic Development Act of 1965, and Small Business Administration Loan Assistance at the four percent rate. Substantial areas may also be eligible for such benefits, at least to include Public Works grants under Title I of the Act.

• All areas which were substantial or persistent on March 1, 1965, will continue to be eligible for Public Works Economic Development Act assistance until the first annual review of eligibility under the latter Act, which is presently scheduled for completion in June 1966.

Under the new criteria and standards, the number of areas of substantial or persistent unemployment as of November 1965 totals 527 (188 substantial and 339 persistent, plus five cities) broken down as follows:

• 20 major areas (10 substantial and 10 persistent plus five cities).

• 88 small areas (39 substantial and 49 persistent).

• 419 very small areas (139 substantial and 280 persistent).

Eight states have major labor surplus areas designated either persistent or substantial or both; California and Pennsylvania have six each, followed by Massachusetts with four, West Virginia with three, New Jersey and Puerto Rico with two each and Florida and Minnesota with one each.

Air Force Tests New Search and Rescue Devic

The Air Force has completed series of flight tests on a new dev which, when installed in aircraft, n simplify present day search rescue procedures.

Known as the C–141 Leigh Cr Position Indicator, the device cons of a beacon transmitter encased i tumbling airfoil and tuned to standard Air Force emergency quency.

Flight tests consisted of nine ejections of the crash position i cator made from a Lockheed C– Starlifter at the Air Force Syst Command's Air Force Missile velopment Center, Holloman A N.M.

The crash position indicator is cated in an escape hatch behind wing of the aircraft and is flush the skin of the fuselage. Under en gency conditions a series of sen indicate the emergency to the air component causing a spring to its leading edge into the airstr after which the airfoil automatic ejects itself from the aircraft.

The airfoil, made of styrof flutters to the ground like a huge ing leaf. From its position on ground or water the indicator br casts its location to search par seeking survivors from the crash.

Two additional missions are pla for early 1966 when a crash reco will also be tested in conjunction a small tape cassette inside the bling airfoil section on one C– aircraft. By including the radio tr mission recorder in the crash pack the pilot's last transmissions the aircraft are preserved for u determining the cause of the mi Recorders in current military civilian aircraft are often dest upon impact if the aircraft crash

(*Continued from Page 2*)

drug for fulciparum malaria and a wide variety of surveillance devices, weapons, munitions and personal equipment.

Military Construction.

As shown on Table 3, the bulk of the $1.2 billion requested for military construction is for facilities in Southeast Asia; the balance is for a variety of supporting facilities along the lines of communication back to the United States and, to a small extent, for training and troop facilities within the United States. The $1,238 million requested in this Supplemental, together with the $166 million provided by the August Amendment, will make a total of $1,404 million available for construction in support of Southeast Asia in FY 1966, $355 million more than the entire appropriation for military construction in FY 1965.

The explanation for this large request lies in the nature of the military operation we have undertaken in Southeast Asia. South Vietnam itself is primarily an agricultural country; the only major port is Saigon. The deployment of large U.S. military forces, and other friendly forces such as the Korean division, in a country of this sort requires the construction of new ports, warehouse facilities, access roads, improvements to highways leading to the interior of the country and along the coasts, troop facilities, hospitals, completely new airfields and major improvements to existing airfields, communications facilities, etc. We will be prepared to house and support additional units if their deployment should be required in the future. Since construction is a long lead time activity, the great bulk of this requirement has to be financed in the FY 1966 Supplemental. In order to provide some flexibility in the utilization of these funds, we are requesting that $200 million of the $1,238 million total program be appropriated to "Military Construction, Defense Agencies" for later transfer to the Military Departments as required.

Although I cannot assure you that the funds requested in this Supplemental will complete our construction program in Southeast Asia, since we do not know how the conflict there may evolve, I can tell you that the amount included in the FY 1967 Budget for military construction is very much smaller.

Financial Requirements.

Table 4 summarizes our financial requirements for the current fiscal year. The first column shows the amounts thus far enacted, less the $1.7 billion Amendment which is shown in the second column. The third column shows the net additional amounts required in FY 1966 to defray the costs of the pay raises enacted last year. The fourth column is the Supplemental for Southeast Asia which I have discussed, and the fifth column shows the total, $63,308,175,000 in new obligational authority, which would be available for the current fiscal year if the military and civilian pay supplemental and the Southeast Asia Supplemental are enacted as requested. . . .

Additional Authorizations.

The additional amounts requested to be authorized for aircraft, missiles, naval vessels and tracked combat vehicles and RDT&E, are shown in Tables 5 through 7. The additional military construction authorizations are identical to the amounts requested for appropriation, as shown on Table 3.

The President, in his State of the Union Address to the Congress on January 13, discussed the reasons for our greater military involvement in Southeast Asia and the resulting increases in Defense expenditures. I have attempted in this statement to outline the purposes for which the additional funds requested in this Supplemental are required. I can assure you that my associates in the Defense Department and I have reviewed this Supplemental with great care, and we now stand ready to help you in every way we can to facilitate the passage of the necessary legislation.

Table 1

Summary of Force and Personnel Increases Related to Southeast Asia

	Approved Aug. 65	Revised Jan. 66
1. Increase in Army Forces		
a. Division and Initial Support Forces		
b. 3 Brigades and Initial Support Forces		
c. Aviation Companies		
d. Sustaining Support for 1 Division, 3 Brigades and other forces		
e. STRAF support forces		
f. Expand training base and pipeline		
Total Army	235,000	306,657
2. Increase in Marine Forces		
a. 1 Division		
b. Activate forces to be deployed to Vietnam		
c. Bring units to be deployed to full strength		
d. Expand training and support base		
e. Provide increased pipeline		
Total Marine Corps	30,000	85,169
3. Increase in Naval Forces		
a. Retain ships		
b. Activate or procure ships		
c. Increase manning for deployed ships and bases in Southeast Asia		
d. Augment coastal and river patrol		
e. Augment construction forces		
f. Support of Marine Forces		
g. Flight training		
Total Navy	35,000	55,450

Table 1—Continued

Summary of Force and Personnel Increases Related to Southeast Asia

4. Increase in Air Forces		
a. B-52 aircraft deployed to Guam		
b. Tac. Ftr. and Troop Carrier Squadrons deployed to SEA and their CONUS rotation base		
c. Raise airlift aircraft utilization rates		
d. Expand training		
e. Other support (including logistical base)		
Total Air Force	40,000	63,24
Total Active Force Military	340,000	510,52
Adj. for substitution of civilians	------	−74,30
Other adjustments	------	+16,62
Net Increase	340,000	452,84
5. Increased Readiness for Reserve Components		
Army:		
a. To raise 3 Division and 6 Brigade Forces to 100% manning		18,5(
b. To man other ANG units at their authorized strengths	------	20,0(
Total Army	------	38,5(
Marine Corps:		
c. Reserve Division/Wing Team	2,500	2,50
Air Force:		
d. 9 F-100 Squadrons	1,667	1,6(
e. 4 RF-84 Squadrons	697	6(
f. 1 Tac. Control Group	------	4(
g. 11 C-124 Squadrons	2,205	2,2(
Total Air Force	4,569	5,0(
6. Increase in Direct Hire Civilian Personnel		
a. Army	11,600	31,1(
b. Navy (Including Marine Corps)	15,500	21,4(
c. Air Force	7,300	18,3(
d. Defense Agencies	1,362	4,8(
Total Personnel	35,762	75,7(
Adjustment for substitution of civilians	------	+58,0(
Other adjustments	------	−4,5(
Net Increase	35,762	129,2(

[a] Was to be determined.

[b] The remaining 11,500 personnel required to raise the manning of the Selected Reserve Force to 100 percent is being provided by redistri tion from units for which there is no requirement in th contingency plans.

[c] Represents increase over the end FY 1966 Army National Guard drill pay strength of 380,000 provided for in the FY 1966 Appropriation /

Table 2

Recapitulation of Military and Civilian Personnel Authorizations

	Budgeted Strength as of 6/30/66 Per Original Budget (1)	Increases Proposed as of Aug. 65 and Jan. 66 (2)	Adj. for Substitution of Civilians (3)	Other Adjustment (4)	Net Increase Proposed (5)	Strength Increase to be Realized By 6/30/66 (6)	After 6/30/66 (7)
Active Duty Military Personnel							
Army	953,094	306,657	−36,500	+10,432	280,599	205,949	74,65(
Navy	684,848	55,450	−15,000	+ 2,575	43,025	38,875	4,15(
Marine Corps	193,190	85,169	− 2,800	+ 2,625	84,994	56,889	28,10(
Air Force	809,134	63,245	−20,000	+ 980	44,225	45,364	−1,13(
Total	2,640,266	510,521	−74,300	+16,622	452,843	347,077	105,76(
Direct Hire Civilian Personnel							
Army	317,152	31,133	+26,585	−16,947	40,771	42,480	−1,70(
Navy (Incl. USMC)	320,125	21,400	+14,415	+ 6,953	42,768	37,476	5,29(
Air Force	286,099	18,355	+17,000	−12,737	22,618	15,279	7,33(
Defense Agencies	40,778	4,893	------	+18,177	23,070	27,727	−4,65(
Total	964,154	75,781	+58,000[a]	− 4,554	129,227	122,962	6,26(

* Denotes a small decrease in strength after end FY 1966.

[a] Excludes 2,500 additional Indirect Hire Civilians, bringing the total to 60,500.

Table 3

FY 1966 Supplemental for Procurement, RDT&E and Military Construction Related to Southeast Asia

(NEW OBLIGATIONAL AUTHORITY IN MILLIONS OF DOLLARS)

Procurement	Army	Navy	Marine Corps	Air Force	Defense Agencies	Total
Ammunition Consumption	671	366	338	758		2133
Aircraft						
Attrition	400	562	*	837		1799
Equip. of New Units	168		*			168
Spares	221	149	*	555		925
Other A/C Equipment	37	27	*	194		258
Total Aircraft	826	738	*	1586		3150
Vehicles	329	39	71	66		505
Elect. & Comm.	241	45	42	76		404
Other	398	184	66	179		827
Total Procurement	2465	1372	517	2665		7019
RDT&E	28	53	*	71		152
Military Construction						
South Vietnam	408	207	*	110		725
Other Locations	172	83	*	198		453
Planning	30	15	*	16		61
Total Program	610	305	*	324		1238
To be Approp. to Mil. Dept.	510	255	*	274		1038
To be Approp. to Def. Agencies					200	200
Total Appropriation	510	255	*	274	200	1238

* Included in the Navy.

Note: Detail may not add to totals due to rounding.

Table 4

Financial Summary of FY 1966 Budget Including the Proposed Supplemental for Southeast Asia

(IN THOUSANDS OF DOLLARS)

	NOA Enacted Excluding Amendment	$1,700 Million Amendment	Military and Civilian Pay Supplemental	S.E.A. Supplemental	Total NOA
MILITARY PERSONNEL					
Military Personnel, Army	4,092,291	------	222,100	833,600	5,147,991
Military Personnel, Navy	3,055,000	------	182,600	318,500	3,556,100
Military Personnel, M.C.	749,900	------	42,400	184,600	976,900
Military Personnel, A.F.	4,393,800	------	227,600	219,300	4,840,700
National Guard Personnel, Army	271,800	------	4,500	45,900	322,200
Reserve Personnel, Army	238,600	------	------	7,500	246,100
National Guard Personnel, A.F.	71,300	------	3,500	5,700	80,500
Reserve Personnel, Navy	105,100	------	4,600	------	109,700
Reserve Personnel, M.C.	33,000	------	1,600	2,200	36,800
Reserve Personnel, A.F.	60,500	------	1,200	2,700	64,400
Retired Pay, Defense	1,529,000	------	71,000	------	1,600,000
Total Military Personnel	14,600,291	------	761,100	1,620,000	16,981,391
OPERATION & MAINTENANCE					
Oper. & Maint., Army	3,434,067	------	33,400	1,077,200	4,544,667
Oper. & Maint., Navy	3,292,137	------	23,000	506,000	3,821,137
Oper. & Maint., M.C.	192,101	------	1,054	102,600	295,755
Oper. & Maint., A.F.	4,403,737	------	27,600	544,900	4,976,237
Oper. & Maint., Def. Agencies	683,680	------	14,356	41,769	739,805
O&M, Army National Guard	208,796	------	2,000	35,700	246,496
O&M, Air National Guard	238,000	------	1,000	8,100	247,100
National Bd for Prom.R.P., Army	459	------	------	------	459
Claims, Defense	24,000	------	------	------	24,000

Table 4—Continued

Financial Summary of FY 1966 Budget Including the Proposed Supplemental for Southeast Asia

(IN THOUSANDS OF DOLLARS)

Contingencies, Defense	15,000	------	------	------	15,000
Ct of Mil. Appeals, Defense	579	------	11	------	590
Total Oper. & Maint.	12,492,556	------	102,421	2,316,269	14,911,246
PROCUREMENT					
Proc. of Equip. & Msls, Army	1,204,800	504,500	------	2,465,000	4,174,300
Proc. of A/C & Msls, Navy	2,220,387	190,200	------	764,500	3,175,087
Shipbldg. & Conv., Navy	1,590,500	------	------	------	1,590,500
Other Procurement, Navy	1,135,000	167,090	------	607,500	1,909,590
Procurement, M.C.	43,800	149,100	------	516,600	709,500
A/C Proc., Air Force	3,516,700	158,800	------	1,585,700	5,261,200
Missile Proc., Air Force	771,900	4,000	------	63,700	839,600
Other Proc., Air Force	829,100	360,600	------	1,016,400	2,206,100
Proc., Defense Agencies	15,200	------	------	------	15,200
Total Procurement	11,327,387	1,534,290	------	7,019,400	19,881,077
RES., DEV., TEST, & EVAL.					
RDT&E, Army	1,433,988	------	------	27,995	1,461,983
RDT&E, Navy	1,513,130	------	------	52,570	1,565,700
RDT&E, Air Force	3,181,956	------	------	71,085	3,253,041
RDT&E, Defense Agencies	491,300	------	------	------	491,300
Emergency Fund, Defense	19,426	------	------	------	19,426
Total—RDT&E	6,639,800	------	------	151,650	6,791,450
MILITARY CONSTRUCTION					
Military Constr., Army	346,843	64,600	------	509,700	921,143
Military Constr., Navy	329,405	43,210	------	254,600	627,215
Military Constr., A.F.	361,773	57,900	------	274,100	693,773
Mil. Con., Def. Agencies	19,768	------	------	200,000	219,768
Mil. Con., Army Res.	------	------	------	------	------
Mil. Con., Naval Res.	9,500	------	------	------	9,500
Mil. Con., A.F. Res.	4,000	------	------	------	4,000
Mil Con., Army N.G.	10,000	------	------	------	10,000
Mil Con., Air N.G.	10,000	------	------	------	10,000
Loran Stations, Defense	5,000	------	------	------	5,000
Total—Mil. Constr.	1,096,289	165,710	------	1,238,400	2,500,399
FAMILY HOUSING					
Family Housing, Defense	665,846	------	------	------	665,846
CIVIL DEFENSE					
O&M, Civil Defense	64,066	------	------	------	64,066
Research, Shelter Survey and Marking, Civ. Def.	42,700	------	------	------	42,700
Total—Civil Defense	106,766	------	------	------	106,766
Total—Mil. Functions	46,928,935	1,700,000	863,521	12,345,719	61,838,175
MILITARY ASSISTANCE					
Military Ass't., Executive	1,470,000	------	------	------	1,470,000
TOTAL—DEPT OF DEFENSE	48,398,935	1,700,000	863,521	12,345,719	63,308,175
RECAPITULATION					
Army	11,241,644	569,100	262,000	5,002,595	17,075,339
Navy	14,268,960	549,600	255,254	3,309,670	18,383,484
Air Force	17,842,766	581,300	260,900	3,791,685	22,476,651
Defense Agencies	3,468,799	------	85,367	241,769	3,795,935
Civil Defense	106,766	------	------	------	106,766
Military Assistance	1,470,000	------	------	------	1,470,000
TOTAL	48,398,935	1,700,000	863,521	12,345,719	63,308,175

Table 5

Amounts Requested for Aircraft, Missiles, Ships and Tracked Combat Vehicle Procurement Authorization in FY 1966 Supplemental Request

(IN THOUSANDS)

	Authorized * FY 1966	Appropriated * FY 1966	Supplemental (NOA) FY 1966
Aircraft			
Army	485,400	485,400	825,600
Navy & Marine Corps	2,100,400	2,104,500	738,300
Air Force	3,709,000	3,675,800	1,585,700
Missiles			
Army	250,700	277,000	64,000
Navy	369,600	358,200	26,200
Marine Corps	15,200	15,200	27,500
Air Force	800,100	800,100	63,700
Naval Vessels			
Navy	1,721,000	1,590,500	
Tracked Combat Vehicles			
Army			75,800
Marine Corps			10,900
Totals	9,451,400	9,306,700	3,417,700

* Includes amounts totaling $[illegible] million provided thru Emergency Fund SEA, PL 89-213.

Table 6

Source of Funds for Aircraft, Missiles, Ships and Tracked Combat Vehicles FY 1966 Supplemental Procurement Program

(IN THOUSANDS)

	Total FY 1966 Program	Funding Available * for Financing Program in Part	NOA Requested for Authorization
Aircraft			
Procurement of Equipment and Missiles, Army	1,333,200	507,600	825,600
Procurement of Aircraft and Missiles, Navy (and Marine Corps)	3,234,000	2,495,700	738,300
Aircraft Procurement, Air Force	5,586,200	4,000,500	1,585,700
Sub-Total Aircraft	10,153,400	7,003,800	3,149,600
Missiles			
Procurement of Equipment and Missiles, Army	368,600	304,600	64,000
Procurement of Aircraft and Missiles, Navy	381,600	355,400	26,200
Procurement, Marine Corps	42,700	15,200	27,500
Missile Procurement, Air Force	1,242,800	1,179,100	63,700
Sub-Total Missiles	2,035,700	1,854,300	181,400
Naval Vessels			
Shipbuilding and Conversion, Navy	1,930,500	1,930,500	
Tracked Combat Vehicles			
Procurement of Equipment and Missiles, Army	375,700	299,900	75,800
Procurement, Marine Corps	13,400	2,500	10,900
Sub-Total Tracked Combat Vehicles	389,100	302,400	86,700
GRAND TOTAL	14,508,700	11,091,000	3,417,700

* Includes total amount of $[illegible] million provided thru Emergency Fund SEA, PL 89-213.

Table 7

Amounts Requested for RDT&E Authorization in FY 1966 Supplemental Request

(IN THOUSANDS)

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION	Authorized FY 1966	Appropriated FY 1966	Supplemental (NOA) FY 1966
Army	$1,406,400	$1,406,400	$ 27,9[illegible]
Navy (including the Marine Corps)	1,439,200	1,439,200	62,[illegible]
Air Force	3,103,900	3,103,900	71,0[illegible]
Defense Agencies	495,000	495,000	
Emergency Fund	n/a	125,000	
Total	$6,444,500	$6,569,500	[illegible]

Subcontracting Spreads Dollar

(*Continued from Page 19*)

For example, Rohr Corp. of Chula Vista, Calif., largest C-141 subcontractor, sublets 49 percent of its contract on engine nacelles. Companies receiving this 49 percent from Rohr, in turn sublet 40 percent of their part to other firms. Rohr's subcontractors at the time the study was made totaled $85.9 million; since then additional millions are being negotiated for follow-on C-141's.

The defense dollar that goes from Lockheed in Georgia to General Dynamics/Convair in San Diego, Calif., another major subcontractor, drifts downward through four levels. Convair builds the empennage for the Starlifter. At the time of the study, Convair's subcontract amounted to $43.2 million and negotiations are under way for follow-on C-141's. Convair sublet 25 percent. Recipients of this portion, in turn, sublet 20 percent to others. The third group of companies sublet 10 percent.

Before the C-141 program began in 1961, prime contractors subcontracted about one-third of their program received from the Defense Department. Lockheed-Georgia sublet 35 percent of the C-130 aircraft program. On the C-141 program, however, Lockheed established a record by subletting approximately 62 percent.

The Defense Department encourages this type of dollar sharing. So, when the C-5A competition came along, Lockheed proposed subcontracting the same amount. Douglas and Boeing, competing for the C-5A, likewise offered tremendous subcontracting programs.

Within the next few months, firms all over America will be building parts and systems of the C-5A to send to Marietta, Ga., for assembly with the in-house-built pieces into the world's biggest airplane. Defense dollars already are being spent throughout the nation to obtain raw material for production.

Changes In Army Aviation Program

(*Continued from Page 21*)

Army divisions gave us a capability which no other Army in the world possesses.

On July 3 the 11th Air Assault Division was officially designated the 1st Cavalry Division (Airmobile) at Fort Benning, Ga. For the first time in 22 years the colors of the 1st Cavalry were in the United States; but they were not to remain here long. In view of the requirement for additional U.S. forces in Vietnam, it was only logical that the 1st Air Cavalry Division be considered for deployment. After intensified training, the division deployed to Vietnam, arriving in mid-September.

The tempo of activities of the 1st Cavalry Division can be expected to increase sharply in the next few months. I would, however, like to sound a word of caution. The division has received much attention and has perhaps gotten too great a buildup as to what can be expected of it. This could lead to disappointment. We expect tht division to pull its weight in the Republic of Vietnam, but no one division is going to clean up that messy war and we should not look for miracles.

The FDL Ship Project

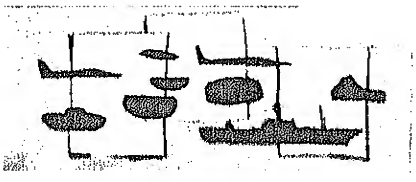
(*Continued from Page 6*)

tition by the prime contractor for such team members during the final phases of source selection for the total package contract.

The major in-house effects expected in this area are a shift in design emphasis and provision for major industry input into the contract definition process. The planned use of ship performance requirements and standards, instead of detailed ship specifications, is intended to elicit industry's maximum ingenuity and engineering inventiveness during this phase. This approach is expected to strengthen the overall ship design capabilities in the country.

Figure I relates the FDL Ship Project Office to the Naval Establishment. Of particular importance for this Secretary of the Navy-designated project is the "unitary" aspect of the office with reporting responsibility to the Secretary of the Navy through both the Chief of Naval Material and the Chief of Naval Operations for their respective areas of responsibility. This unique combination of both the user and the producer aspects of the ship procurement equation is expected to facilitate the introduction of the new procedures I have described to the ship acquisition process. Figure II delineates the FDL Ship Project organization as it now exists.

In summary, our goals are to carry out trial applications of contract definition and total package concept for ship procurement while developing a seaborne rapid deployment system.



DEFENSE PROCUREMENT

ontracts of $1,000,000 and over warded during the month of January 966:

DEFENSE SUPPLY AGENCY

B. G. Colton Division of Raylon Fabrics, New York City. $3,[illegible]. [illegible] linear yards of cotton and nylon sateen cloth. Lanett, Ala. and Westerly, R.I. Defense Personnel Support Center, Philadelphia.

Erwin Mills Division of Burlington Industries, New York City. $1,161,[illegible]. 1,161,000 linear yards of cotton and nylon sateen cloth. Cooleemee, N.C. Defense Personnel Support Center, Philadelphia.

C. M. London Co., New York City. $2,183,173. 1,342,500 linear yards of cotton and nylon sateen cloth. Greenville, S.C. and Bradford, R.I. Defense Personnel Support Center, Philadelphia.

Cleveland Woolens Division of Burlington Industries, Cleveland, Tenn. $1,[illegible]. 200,000 woolen blankets. Cleveland. Defense Personnel Support Center, Philadelphia.

Southern Athletic Co., Knoxville, Tenn. $1,625,000. 500,000 pairs of men's cotton poplin trousers. Knoxville. Defense Personnel Support Center, Philadelphia.

Go Con Corp., Dallas, Tex. $1,[illegible]. 4,317 large general purpose tents with covers. Jacksonville, Tex. Defense Personnel Support Center, Philadelphia.

Socony Mobil Oil Co., New York City. $2,[illegible]. Petroleum products to be delivered to various posts and stations on the east coast. Defense Fuel Supply Center, Alexandria, Va.

Shell Oil Co., New York City. $1,[illegible]. Petroleum products to be delivered to various posts and stations on the east coast. Defense Fuel Supply Center, Alexandria, Va.

Stewart Avionics, Brooklyn, N.Y. $1,[illegible]. [illegible] sets of portable flood lights. Defense General Supply Agency, Richmond, Va.

Riegel Textile Corp., New York City. $3,084,000. [illegible] million yards of cotton sateen cloth. Trion, Ga. Defense Personnel Support Center, Philadelphia.

J. P. Stevens And Co., New York City. $[illegible]. 3,959,[illegible] yards of cotton sateen cloth. Rock Hill, Piedmont, Mohawk and Wallace, S.C. Defense Personnel Support Center, Philadelphia.

B. G. Colton Division of Raylon Fabrics, New York City. $1,146,165. 2,[illegible] yards of cotton sateen cloth. Monroe and Columbus, Ga.; Memphis, Tenn. and Hallsboro, N.C. Defense Personnel Support Center, Philadelphia.

Warren Co., Atlanta, Ga. $1,[illegible]. 1,[illegible] refrigerators. Atlanta. Defense General Supply Center, Richmond, Va.

Bowling Bag Co., Valdosta, Ga. $1,[illegible]. 800,000 sand bags. Valdosta and Savannah, Ga. Defense General Supply Center, Richmond, Va.

Southern Athletic Co., Knoxville, Tenn. $1,095,600. 250,000 men's cotton poplin wind-resistant coats. Knoxville. Defense Personnel Support Center, Philadelphia.

[illegible]-Weld Corp., Simpson, Pa. $4,[illegible]. [illegible],000 metal shipping boxes. Simpson. Defense General Supply Center, Richmond, Va.

[illegible]dart Products, St. Louis. $1,102,[illegible]. [illegible],082 steel clothing lockers. [illegible]. Defense General Supply Center, Richmond, Va.

[illegible]k Wire Corp., Cleveland, Ohio. $5,[illegible],000. 800,000 coils of concertina wire. [illegible]nton, Ohio. Defense Construction Supply Center, Columbus, Ohio.

[illegible]thwestern Steel & Wire Co., Sterling. $1,635,023. 162,644 coils of concertina [wire]. Sterling. Defense Construction Supply Center, Columbus, Ohio.

[illegible] Myers Co., Protection, Kan. $1,[illegible],500. 160,000 coils of concertina wire. [Pro]tection. Defense Construction Supply Center, Columbus, Ohio.

ARMY

3 Switlik Parachute Co., Trenton, N.J. $1,126,[illegible]. Personnel parachutes. Trenton. Army Aviation Materiel Command, St. Louis.

Aeronetics Division of General Time Corp., Stamford, Conn. $2,762,000. Bomb fuzes. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill.

Continental Motors, Muskegon, Mich. $1,[illegible]. Tank engine assemblies. Muskegon. Army Tank Automotive Center, Warren, Mich.

LTV Michigan Division of LTV Aerospace Corp., Warren, Mich. $1,957,666. Industrial services and documentation for the LANCE missile. Warren. Army Missile Plant, Warren, Mich.

Remington Arms Co., Bridgeport, Conn. $[illegible]. 7.62mm cartridges. Bridgeport. Frankford Arsenal, Philadelphia.

Olin Mathieson Chemical Corp., East Alton, Ill. $1,[illegible]. 5.56mm cartridges. East Alton. Frankford Arsenal, Philadelphia.

Inks-Evans Mfg. Co., St. Louis. $2,[illegible]. 7.62mm metallic belt cartridges. St. Louis. Frankford Arsenal, Philadelphia.

Elsen Bros., Hoboken, N.J. $1,[illegible]. Metal parts assemblies for hand grenades. Lodi, N.J. Ammunition Procurement and Supply Agency, Joliet, Ill.

Supreme Products Corp., Chicago. $2,[illegible]. Ordnance parts. Chicago. Ammunition Procurement & Supply Agency, Joliet, Ill.

Ingraham Co., Bristol, Conn. $3,[illegible]. Ordnance items. Waterbury and Bristol, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill.

General Time Corp., LaSalle, Ill. $3,285,[illegible]. Ordnance items. Peru, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

Honeywell, Inc., Hopkins, Minn. $2,[illegible]. Automatic assembly and support equipment for 81mm projectiles. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

Trenton Textile Engineering and Manufacturing Co., Trenton, N.J. $1,[illegible]. Ordnance items. Trenton and Philadelphia. Ammunition Procurement & Supply Agency, Joliet, Ill.

Eagle Picher, Joplin, Mo. $2,157,840. Ordnance items. Joplin. Harry Diamond Laboratories, Washington, D.C.

Olin Mathieson Chemical Corp., East Alton, Ill. $3,[illegible]. 7.62mm ammunition. East Alton. Frankford Arsenal, Philadelphia.

Olin Mathieson Chemical Corp., New Haven, Conn. $15,[illegible]. 7.62mm ammunition. New Haven. Frankford Arsenal, Philadelphia.

Technical Operations, Inc., Burlington, Mass. $3,[illegible]. 12-month program to supply scientific and operations research support for the Combat Development Command. Fort Belvoir and Fort Lee, Va. Northeast Procurement Agency, Oakland, Calif.

4 AVCO Corp., Cincinnati, Ohio. $2,851,100. Operation, modification and maintenance of missile tracking and instrumentation radars and interfacing equipment. White Sands Missile Range, N.M. White Sands Missile Range Headquarters, N.M.

5 American Dredging Co., Philadelphia. $3,[illegible]. Dredging work at the Wilmington Harbor, N.C., project. Engineer Dist., Wilmington, N.C.

6 Collins Radio Co., Dallas, Tex. $2,371,660. Radio sets (AN/ARC-51). Dallas. Army Electronics Command, Fort Monmouth, N.J.

Collins Radio Co., Cedar Rapids, Iowa. $1,491,622. Radio sets (AN/ARC-102). Cedar Rapids. Army Electronics Command, Fort Monmouth, N.J.

7 Kuzens Luhr and Co., Massman Construction Co. and Patton-Tully Transportation Co., Columbia, Ill. $1,996,000. Work on Mississippi River Project. Cairo and Chester, Ill. Engineer Dist., St. Louis.

Wilcox Electric Co., Kansas City, Mo. $1,000,000. Electronics equipment. Army Electronics Command, Fort Monmouth, N.J.

Boeing Co., Morton, Pa. $1,281,625. Production equipment for aircraft. Morton. Army Aviation Materiel Command, St. Louis.

AVCO Corp., Stratford, Conn. $1,062,328. T 53 L-7 engines for the OV-1 aircraft. Stratford. Army Aviation Materiel Command, St. Louis.

8 Studebaker Corp., Minneapolis, Minn. $1,797,000. 60-cycle generator sets. Minneapolis. Army Mobility Equipment Center, St. Louis.

10 Holston Defense Corp., Kingsport, Tenn. $1,488,876. Explosives and propellants of various types. Kingsport. Ammunition Procurement & Supply Agency, Joliet, Ill.

11 Weaver Construction Co., Denver, Colo. $2,030,000. Construction of four motor repair shops and facilities at Fort Carson, Colo. Engineer Dist., Omaha, Neb.

Universal Constructors, Inc., Albuquerque, N.M. $2,274,076. Work on the Cochiti Dam and Reservoir, Rio Grande, N.M. Engineer Dist., Albuquerque, N.M.

12 Raytheon Co., Lexington, Mass. $2,176,000. Work on the design and development of the HAWK anti-tactical ballistic missile system. Bedford, Mass. Army Missile Command, Huntsville, Ala.

Sylvania Electric Products, Needham, Mass. $1,500,000. Production of classified electronics equipment. Needham. Army Electronics Command, Fort Monmouth, N.J.

Olin Mathieson Chemical Corp., New York City. $1,030,030. Partial re-activation of Badger Army Ammunition Plant, Baraboo, Wis. and production of small arms ammunition. New York City. Ammunition Procurement & Supply Agency, Joliet, Ill.

14 Federal Cartridge Corp., Minneapolis. $3,779,831. Loading, assembly and packing of 7.62mm ammunition. Minneapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

Remington Arms Co., Bridgeport, Conn. $7,300,902. Loading, assembly and packing of 7.62mm and 20mm ammunition. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

Day & Zimmermann, Philadelphia. $5,763,714. Loading, assembly and packing of 66mm rockets and components. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

Martin K. Eby Construction Co., Wichita, Kan. $1,778,942. Work on Gillham Dam and Reservoir, Arkansas Project, DeQueen, Ark. Engineer Dist., Tulsa, Okla.

Pensacola Construction Co., Kansas City, Mo. $1,072,082. Bank stabilization work on the Arkansas River Project. Gould, Ark. Engineer Dist., Little Rock, Ark.

General Electric Co., Burlington, Vt. $5,092,491. 7.62mm aircraft machine guns, tools and repair parts to support the Air Force and Army firing program. Burlington. Army Weapons Command, Rock Island, Ill.

Connecticut Cartridge Corp., Plainville, Conn. $1,350,000. 20mm cartridge cases. Plainville. Frankford Arsenal, Philadelphia.

Martin Marietta Corp., Orlando, Fla. $3,500,000. Research and development of improved ground support equipment for the PERSHING weapon system. Orlando. Army Missile Command, Huntsville, Ala.

17 Emerson Electric Co., St. Louis. $2,362,130. Helicopter armament subsystems. St. Louis, and Mount Pleasant, Iowa. Army Weapons Command, Rock Island, Ill.

Johnson Furnance Co., Bellevue, Ohio. $6,103,623. Production of 1½-ton cargo trailers and 1½-ton trailer chassis. Bellevue. Army Tank Automotive Center, Warren, Mich.

Global Associates, Oakland, Calif. $6,285,181. Base logistics support, Kwajalein Test Site. Kwajalein Atoll, Marshall Islands. NIKE X Project Office, Huntsville, Ala.

18 William A. Smith Construction Co., Kansas City, Kan. $5,807,793. Work on the Red Rock Dam and Reservoir, Des Moines River, Iowa, Project. Knoxville, Iowa. Engineer Dist., Rock Island, Ill.

Raytheon Co., Waltham, Mass. $1,016,618. Electron tubes for the HAWK missile system transmitter. Waltham. Army Electronics Command, Philadelphia.

Continental Aviation & Engineering Corp., Detroit. $1,037,277. Continuation of production engineering services for engines applicable to 2½ and 5-ton trucks. Detroit. General Purpose Vehicle Project Manager, Warren, Mich.

Aluminum Company of America, Pittsburgh, Pa. $10,670,714. Aluminum components for SHAKEYE 1 and 2. Alcoa, Tenn., Rockdale, Tex. and Logan's Ferry, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.

Dow Chemical Co., Midland, Mich. $2,418,000. 2.75" rockets. Findley, Ohio. Navy Propellant Plant, Indian Head, Md.

United Aircraft, East Hartford, Conn. $2,240,242. Assemblies to support jet engines in F-100 and F-102 aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

General Dynamics, Pomona, Calif. $1,110,816. Guidance control systems for the TERRIER missile. Pomona. Navy Ships Parts Control Center, Mechanicsburg, Pa.

James E. Cox Construction, Charlotte, N.C. $1,009,101. Construction of aircraft maintenance shops at Marine Corps Air Station, Cherry Point, N.C. Dir., Atlantic Div., Bureau of Yards and Docks.

United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $12,511,404. [illegible] engines for the Air Force. East Hartford. Bureau of Naval Weapons.

University of Alaska, College, Alaska. $1,209,110. Research in arctic problems. Point Barrow, Alaska. Office of Naval Research.

United Aircraft, East Hartford, Conn. $6,121,300. [illegible] engines for Navy aircraft. East Hartford. Bureau of Naval Weapons.

Martin Marietta Corp., Orlando, Fla. $12,055,410. Production of WALLEYE weapon system and related equipment. Orlando. Bureau of Naval Weapons.

General Electric, Wash., D.C. $[illegible]. Acoustic devices, associated sectors and cable assemblies, repair parts and engineering services. Schenectady, N.Y. Bureau of Ships.

Lear Siegler, Inc., Grand Rapids, Mich. $1,410,252. Components for [illegible] systems. Grand Rapids. Navy Purchasing Office, Wash., D.C.

William E. Arnold Co., Jacksonville, Fla. $[illegible]. Construction of a [illegible] hospital at Jacksonville, Fla. Dir., [illegible] Div., Bureau of Yards & Docks.

Todd Shipyards, Alameda, Calif. $[illegible]. Activation of the tank landing ship USS [illegible]. Alameda. Industrial Manager, 12th Naval Dist.

Triple A Machine Shop, San Francisco. $1,[illegible]. Activation of the tank landing ship USS [illegible]. San Francisco. Industrial Manager, 12th Naval Dist.

Bendix Corp., Baltimore, Md. $[illegible]. [illegible] Baltimore. [illegible]

American Mfg. Co. of Texas, Fort Worth, Tex. $[illegible]. [illegible] Fort Worth. Navy Ships Parts Control Center, Mechanicsburg, Pa.

Lansdowne Steel & Iron Co., [illegible], Pa. $1,[illegible]. [illegible] Navy Ships Parts Control Center, Mechanicsburg, Pa.

Bethlehem Steel Corp., New York City. $[illegible]. [illegible] ships. Sparrows Point, Md. Bureau of Ships.

Loral Corp., Bronx, N.Y. $[illegible]. Doppler navigation radar sets for [illegible] aircraft. [illegible] Navy Purchasing Office, Washington, D.C.

Franklin Institute, Philadelphia. $[illegible]. [illegible] Philadelphia. Office of Naval Research.

Grumman Aircraft Engineering Corp., Bethpage, N.Y. $[illegible]. [illegible] aircraft. Bethpage. Bureau of Naval Weapons.

Sanders Associates, Nashua, N.H. $[illegible]. Production of classified electronic equipment. Nashua. Bureau of Naval Weapons.

Honeywell, Inc., Minneapolis, Minn. $[illegible]. [illegible] for F-4B and F-4C aircraft. Minneapolis. Navy Aviation Supply Office, Philadelphia.

AIR FORCE

Sperry Rand Corp., [illegible], Pa. $[illegible]. Antenna [illegible]. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Bell Aerosystems Co., Buffalo, N.Y. $[illegible]. Work on [illegible] engines. Niagara Falls, N.Y. Space Systems Div. (AFSC), Los Angeles.

4 **Lockley Machine Co.,** New Castle, Pa. $1,132,350. Practice bombs. New Castle. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

Continental Aviation & Engineering Corp., Detroit. $2,416,482. Production of J-69 engines for T-37 trainer aircraft. Toledo, Ohio. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

North American Aviation, Anaheim, Calif. $1,420,847. Spare parts for MINUTEMAN ground support equipment. Anaheim. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

5 **General Electric,** Cincinnati, Ohio. $1,500,000. A component improvement program for the J-79 aircraft engine. Evandale, Ohio. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

General Motors, Indianapolis, Ind. $4,649,000. Production of T-56 aircraft engines and related equipment. Indianapolis. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Martin Marietta, Orlando, Fla. $2,567,612. Production of communications equipment for F-4 and F-111 aircraft. Orlando. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Republic Aviation, Farmingdale, N.Y. $1,[illegible]. Engineering services for F-105 aircraft. Farmingdale. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

6 **North American Aviation,** Anaheim, Calif. $[illegible]. Components of the improved MINUTEMAN guidance system. Anaheim. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

General Dynamics, Fort Worth, Tex. $1,[illegible]. Inspection and repair of B-58 aircraft. Fort Worth. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

General Electric, Cincinnati, Ohio. $1,[illegible]. Development work on a vectored [illegible] propulsion system. Cincinnati. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Wichita, Kan. $1,[illegible]. [illegible] program. Wichita. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

Hughes Aircraft, Culver City, Calif. $1,[illegible]. Work on an air-to-surface missile [illegible]. Culver City. Systems Engineering Group, Research & Technology Div. (AFSC), Wright-Patterson AFB, Ohio.

Aircraft Hydroforming Inc., Gardena, Calif. $[illegible]. Aircraft [illegible]. Gardena. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

10 **United Aircraft,** East Hartford, Conn. $[illegible]. Development work on a [illegible] propulsion system. East Hartford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Raytheon Co., Bedford, Mass. $5,293,[illegible]. Work on a [illegible] research program. Bedford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Continental Aviation and Engineering Corp., Detroit, Mich. $1,[illegible]. Production of J-69 engines for T-37 aircraft. [illegible] Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Bendix Corp., Teterboro, N.J. $1,[illegible]. Production of aircraft navigational equipment. Teterboro. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

11 **Lear Siegler, Inc.,** Grand Rapids, Mich. $[illegible]. Production of components for [illegible] aircraft instruments. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

12 **Aerojet General Corp.,** Sacramento, Calif. $[illegible]. Production of components for the TITAN III system. Sacramento. Space Systems Div. (AFSC), Los Angeles.

RCA, Camden, N.J. $1,720,[illegible]. Radar altimeters for [illegible] aircraft. Camden. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Burroughs Corp., Paoli, Pa. $1,[illegible]. Modification of the Air Defense Back-Up Interceptor Control System. Paoli. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

Lockheed Aircraft, Sunnyvale, Calif. $2,[illegible]. Satellite control facility work. Sunnyvale. Air Force Satellite Control Facility (AFSC), Los Angeles.

13 **Lockheed Missiles & Space Co.,** Sunnyvale, Calif. $[illegible]. Production of AGENA boosters. Sunnyvale. Space Systems Div. (AFSC), Los Angeles.

14 **ITT Gilfillan Corp.,** Los Angeles. $1,122,840. Production of modification kits for radar ground controlled landing systems. Los Angeles. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

Pneumo Dynamics Corp., Kalamazoo, Mich. $7,442,134. Production of modification kits, spare parts and related equipment for C-130 aircraft. Grand Rapids, Mich. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

Stewart Warner Corp., Chicago. $1,002,000. Production of communications equipment for F-4C and F-111 aircraft. Chicago. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

17 **Wall Colmonoy Corp.,** San Antonio, Tex. $1,848,607. Repair of jet engine combustion chambers. San Antonio. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

American Electric, Inc., Paramount, Calif. $7,117,422. Production of aircraft ordnance. Long Beach, Calif. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

General Electric, Philadelphia. $11,200,000. Research and development of the MARK 12 re-entry program. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

19 **General Electric,** Philadelphia. $2,500,000. Work on the MARK 12 re-entry vehicle program. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

RCA, Princeton, N.J. $1,000,000. Production of components for a satellite program. Princeton. Space Systems Div. (AFSC), Los Angeles.

Martin-Marietta, Orlando, Fla. $1,311,002. Production of communication equipment for modification of F-105 aircraft. Orlando. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

General Dynamics, San Diego, Calif. $1,500,000. Design and fabrication of components for a space program. San Diego. Space Systems Div. (AFSC), Los Angeles.

20 **Philco Corp.,** Palo Alto, Calif. $2,000,000 and $1,000,000. Work on satellite control network. Palo Alto. Air Force Satellite Control Facility (AFSC), Los Angeles.

Texas Instruments, Inc., Dallas, Tex. $1,136,544. Radar equipment for F-4C aircraft. Dallas. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

Battelle Memorial Institute, Columbus, Ohio. $1,000,000. Operation of the Defense Metals Information Center. Systems Engineering Group (AFSC), Wright-Patterson AFB, Ohio.

General Electric, Cincinnati, Ohio. $1,165,925. Support of the B-70 flight test program. Cincinnati. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Bell Aerospace Corp., Buffalo, N.Y. $2,000,000. Rocket engines. Buffalo. Space Systems Div. (AFSC), Los Angeles.

Oregon Technical Products, Grants Pass, Ore. $1,109,436. Production of bomb racks. Grants Pass. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

21 **Westinghouse Electric,** Baltimore, Md. $2,417,281. Production of major components and spare parts for radar systems. Baltimore. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

24 **General Electric,** Cincinnati, Ohio. $1,632,102. Production of modification kits and spare parts for J-79 aircraft engines. Cincinnati. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

25 **Henry Spen & Co.,** Brooklyn, N.Y. $2,311,500. Production of munitions handling trailers. Brooklyn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

27 **General Electric,** West Lynn, Mass. $59,846,395. Production of aircraft engines (T-64-GE-6, T-64-GE-10 and T-58-GE-10). West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

28 **General Electric,** Philadelphia. $1,500,000. Re-entry vehicle flight test program. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

General Motors, Indianapolis, Ind. $14,121,000. T-56 aircraft engines and related equipment. Indianapolis. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Otis Elevator Co., Stamford, Conn. $1,502,772. Modification of electronic warfare simulators. Stamford. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

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Six New Members Join Defense Industry Advisory Council

Deputy Secretary of Defense Cyrus R. Vance, Chairman of the Defense Industry Advisory Council (DIAC) has announced the appointment of six new members to the council to replace retiring members and fill two vacancies.

The new appointees are:

Fred J. Borch, President, General Electric Co., New York, N. Y.

Kermit Gordon, Vice President, Brookings Institution, Washington, D. C.

Daniel J. Haughton, President, Lockheed Aircraft Corp., Burbank, Calif.

Donald A. Holden, President, Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

Roger Lewis, President, General Dynamics Corp., New York, N. Y.

Noel B. McLean, Chairman of the Board, EDO Corp., College Point, N. Y.

The council was established in May 1962, and has provided a forum for discussions by the Secretary of Defense and his principal assistants with leaders selected from private economy.

The six new members were appointed under a rotation policy designed to provide a wide range of participation and representation while still keeping the council small enough to be workable.

Members of the council who are retiring are:

Elton D. Carter, Consultant, Glen Burnie, Md.

Charles E. Hastings, President, Hastings-Raydist, Inc., Hampton, Va.

J. Ed Warren, President, Cities Service Co., New York, N. Y.

Major General James McCormack, USAF (Ret.), Chairman of the Board and Chief Executive Officer, COMSAT Corp., Washington, D. C.

Consistency in Security Guidance Sought

One of the objectives of the Classification Management Program of the Department of Defense is to avoid and eliminate overlapping and inconsistent classification guidance issued to defense contractors by two or more user agencies.

Classification guidance issued by any single user agency to all of its own contractors may be consistent within that agency but at the same time may be in conflict with guidance to those same contractors issued by one or more other user agencies.

Therefore, it is essential that contractors faced with classification problems resulting from conflicting instructions promptly bring them to the attentio of the user agencies concerned

Concurrent notice to the Di rectorate for Contract Adminis tration of the Defense Suppl Agency, and to the Directorat for Classification Managemen Office of the Assistant Secretar of Defense (Administration), suggested as a helpful method handling such problems.

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C-9

DEPARTMENT OF DEFENSE

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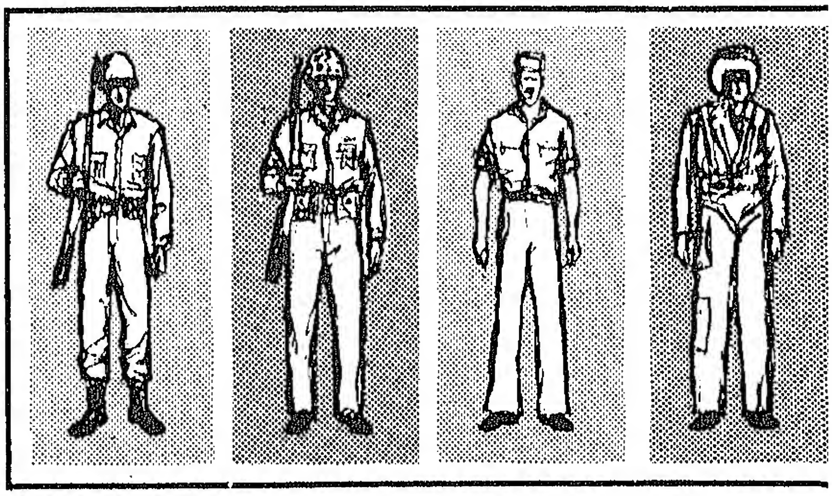
ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

IN THIS ISSUE

DEPARTMENTS

Defense Budget Highlights



Tanks, ships, aircraft, missiles, combat vehicles, small arms, ammuniti communications and electronics equipment, battlefield gear, and jungle bo are some of the items which will be funded by the FY 1967 budget app priation.

This issue of the DEFENSE INDUSTRY BULLETIN is devoted alm entirely to Secretary of Defense Robert S. McNamara's Statement befor joint session of the Senate Armed Services Committee and the Senate S committee on Department of Defense Appropriations on the Fiscal Y 1967-71 Defense Program and 1967 Defense Budget.

While space limitations permit only an abbreviated treatment of the sta ment, an attempt has been made to excerpt those portions which are special interest to defense industry.

We hope this presentation of the annual posture statement will contrib to a more complete understanding by industry of the nation's defense ne

The Editors.

Eight New Members Appointed to Defense Science Board

Eight new members have been appointed to the Defense Science Board, the senior technical advisory body in the Defense Department. It is composed of members appointed from civilian life and of members representing major Federal agencies.

The new members selected are:

Dr. Daniel Alpert, Dean of the Graduate College, University of Illinois, and a former member of the board.

Dr. Alexander Bravelas, Department of Psychology, Stanford University.

Dr. Eugene G. Fubini, Vice President, IBM Corp., and former Assistant Secretary of Defense.

Dr. Richard L. Garwin, Director of Applied Research, T. J. Watson Research Center.

Dr. Richard Latter, Rand Corp.

Dr. Thomas C. Schelling, Center for International Affairs, Harvard University.

Dr. Leonard S. Sheingold, Vice President for Advanced Technology, Sylvania Electronic Systems, and former Chief Scientist for the Air Force.

Dr. Robert L. Sproull, Vice President for Academic Affairs, Cornell University, and former Director of the Advanced Research Projects Agency.

In addition, the following have become members ex officio of the board:

Dr. Harold M. Agnew, Chairman, Army Scientific Advisory Panel.

Dr. Robert C. Seamans, Jr., Deputy Administrator, National Aeronautics and Space Administration.

Mr. Garrison Norton, Chairman, Naval Research Advisory Committee.

The Defense Science Board advises the Secretary of Defense, through the Director of Defense Research and Engineering, on scientific and technical matters of interest to the Defense Department.

Navy Schedules Systems Effectiveness Conference

The Navy's second Systems Effectiveness Conference (SPECON 2) will be held April 21–22 in the State Department's West Auditorium in Washington, D.C.

The conference is being sponsored by the Systems Performance Effectiveness Steering Committee of the Naval Material Support Establishment as a progress report to Government and industry on the development of both technology and management techniques.

Conference sessions will cover: requirements for increased management attention and effect of these requirements on both the Navy and industry; analytical techniques and methodologies for predicting, measuring and demonstrating systems effectiveness; and case history results from concept formulation and contract definition through development as regards systems effectiveness requirements upon project performance.

The first Systems Performance Effectiveness Conference, held last April, was limited to Navy civilian and military personnel with a few special guests. Based on the success of the first SPECON and to provide a progress report on systems performance efforts of the past year, both Government and industry representatives have been invited this year.

For information and program agenda contact: Mr. G. W. Neuman, Executive Secretary, SPE Steering Committee, Bureau of Ships, Code 361B, Washington, D.C. 20360.

DEFENSE INDUSTRY

BULLETIN

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The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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Defense Budget Highlights

Approach to the FY 1967-71 Program and the FY 1966-67 Budget

[Following the method established last year in excerpting the FY 1966 budget statement in the DEFENSE INDUSTRY BULLETIN, paragraph markings have been deleted from the original text of the Secretary of Defense's posture statement for the sake of clarity. In addition some subheads have been added to assist the reader in locating individual programs and subjects.]

As I have noted in previous appearances before this committee, President Kennedy gave me two general instructions when I took office in January 1961:

- Develop the military force structure necessary to support our foreign policy without regard to arbitrary budget ceilings.

- Procure and operate this force at the lowest possible cost.

During the entire five years of my tenure as Secretary of Defense, I have been guided by these two basic principles. Throughout that period I have insisted that our military strategy and plans should be related to the threat, that the forces to be acquired and maintained should be related to the strategy and the plans, and that the forces should be adequately supported, not only with men, equipment and facilities needed in peacetime, but with war reserve stocks as well, so that they could engage in combat for sustained periods of time.

The achievement of this objective has not been easy. For many years our military plans far exceeded the forces available to support them, and even the forces available were not in proper balance with one another. There was not enough tactical air power to support the existing number of Army divisions. In addition, although the concept of a mobile central reserve had been generally accepted, the airlift required to move these forces was completely inadequate, and there was not enough amphibious lift to move the Marine Corps forces. Although a great deal of attention had been paid to nuclear weapons, stocks of ammunition and other combat consumables required for non-nuclear war were grossly deficient in many categories.

Since 1960, we have added some $50 billion to our defense program to correct these deficiencies. By the end of FY 1965 we had achieved a:

- 45 percent increase in the number of combat-ready Army divisions.

- 45 percent increase in the number of combat helicopters.

- 100 percent increase in airlift capability.

- 51 percent increase in the number of Air Force fighter squadrons.

- 100 percent increase in naval ship construction to modernize our fleet.

- 1,000 percent increase in the Special Forces trained for counterinsurgency.

At the same time, we did not neglect our nuclear forces. Indeed, during this period we achieved a:

- 200 percent increase in the number of nuclear warheads and total megatonnage in the strategic alert forces.

- 67 percent increase in the number of tactical nuclear weapons in Western Europe.

But even while these increases in our military strength were being achieved, we moved forward vigorously on President Kennedy's second instruction, "Procure and operate this force at the lowest possible cost."

Each year since its inauguration in FY 1961, we have been able to increase the savings actually realized through our Cost Reduction Program and to increase its goals. In FY 1965, the last completed fiscal year, savings amounted to about $4.8 billion compared with $2.8 billion in FY 1964 and $1.4 billion in 1963. I can assure you that these savings were made without adverse effect on our military strength or combat readiness. Any doubt of this can only be based on a misunderstanding of the way in which we compute our requirements for forces, equipment and ammunition. As noted earlier, it has been my contention from the very beginning that we should first determine as accurately as possible what we need to support the forces required by our war plans; and then buy all of what we need, but only what we need, and buy at the lowest sound price.

In the case of both major equipment and consumables, we must acquire the items needed for the initial outfitting of the forces and for keeping their equipment modern, plus sufficient stocks to meet our peacetime needs, plus a war reserve sufficient to

Secretary of Defense Robert S. McNamara.

meet the logistic standards associated with our contingency war plans. All of these requirements are susceptible to calculation and there is nothing to be gained by buying more than we need at any particular time. Indeed, there is much to be lost since nearly all of these stocks are subject to obsolescence and many items actually deteriorate physically over time. Even under the best of circumstances, we have to dispose of billions of dollars of equipment and supplies each year, and at a mere fraction of their original cost. To the extent we buy more than we need, we simply increase the amount which eventually must be disposed of, thus wasting the taxpayers' money without adding anything of value to our actual military strength.

But the question still remains: Why, if we had acquired what we needed, do we have to increase our procurement so substantially in order to support our military effort in Southeast Asia? The answer to this question has three parts. First, we are increasing the size of our active forces because we do not wish at this time to call up the reserve forces. The new forces must be equipped and supplied.

Second, we do not normally provide in advance for combat attrition of such major weapon systems as aircraft and ships because of the great cost involved. I understand that a war reserve of aircraft was once considered in connection with the military buildup undertaken during the Korean War, but rejected for the same reason. Accordingly, additional aircraft must be procured as soon as the forces are committed to combat, and this was one of the largest items in our FY 1966 supplemental request.

Third, we provide in our war reserve stocks only those quantities of combat consumables needed to tide us over until additional stocks can be acquired from new production. This means that as soon as we start to consume significant quantities of war reserve stocks in combat, we must start to procure replacement stocks. For such items as ammunition, wartime consumption rates are many times peacetime rates. You will see when I discuss our ammunition requirements later in the statement, that it would be entirely impractical to attempt to carry in stock the huge amounts required when our forces actually engage in combat. And, there is no need to do so, as long as we have on hand the essential margin between consumption and production. This margin we have, except in those few cases where materiel is being used in Vietnam in ways and quantities which were never anticipated; for example, the 2.75 inch rocket now being fired in great quantities from helicopters.

This is not to say that every one of the tens of thousands of Defense Department supply points is without a single "inventory shortage." Anyone who has had experience with large supply systems knows that somewhere, something will be lacking. No matter how much we spend for defense, someone somewhere in our far flung organization will be short some item at any particular time. This has nothing to do with the amount of funds requested and appropriated. It simply reflects the fact that no system involving literally hundreds of thousands of people and millions of different items spread around the globe can be one hundred percent perfect. Mistakes in distribution or requirements calculations will be m and these mistakes will be reflecte an inventory shortage, or over somewhere in this system. This is of private industry as well as Gov ment, and it is up to managemen all levels to see to it that these takes are held to a minimum and rected promptly when discovered.

Accordingly, the entire questio shortages must be viewed in pers tive. The acid test of our logis system is the ability of our force take the field and engage in com I submit that the rapid deployn and support in combat of a forc over one-quarter of a million men cluding those aboard ships off coast of Vietnam) to an area 10 miles from our shores clearly den strates that our logistic system that capability. Never before has country been able to field and sup in combat so large a force in so s a time over so great a distance, w out calling up the reserve and with applying price, wage and mate controls to our civilian economy. T is why General Abrams, the Chief of Staff of the Army, was to say last June:

> "The Army is in the best pea time condition in its history. make this statement based on m experience as a battalion cor mander in Europe for 22 montl beginning in 1949, and as cor mander of an armored caval regiment for 14 months ther after, as a division commander Europe from October 1960 to Ju 1962, and as corps command from July 1963 to July 196 From this background and fro my association with soldiers a their equipment, I can state u equivocally that the readine conditions in the U.S. Army a the highest that have been a tained in my 29 years of service

That is why the Secretary Chief of Staff of the Army were to report last August that:

> "The Army was never in a be ter position in peacetime than is today—with respect to bo training and equipment, it is ful prepared to carry out its missi of sustained land combat. Fro the point of view of materiel, th is the direct result of the signi cant equipment procurement a modernization program that h taken place over the past sever years, and the provision of con bat reserves in depth to enab our forces to engage in sustain combat."

That is why General Wheeler, Chairman of the Joint Chiefs of S

U.S. Marines storm ashore near Da Nang.

was able to say last year about forces in Europe:

"I have never known, historically or otherwise, of any Army in peacetime as well equipped, as well trained, as well manned as the Seventh Army today."

With regard to the preparation of the FY 1967-71 program and the FY 1966 supplemental and the FY 1967 budget, we have had to make a somewhat arbitrary assumption regarding the duration of the conflict in Southeast Asia. Since we have no way of knowing how long it will actually last, or how it will evolve, we have budgeted for combat operations through the end of June 1967. This means that if it later appears that the conflict will continue beyond that date, or if it should expand beyond the level assumed in our present plans, we will come back to the Congress with an additional FY 1967 request. If the conflict should end before that date or if rates of consumption are less than planned, we would, of course, have to adjust the programs downward. In either case, further changes in the FY 1967-71 program and the FY 1967 budget may occur.

This situation is not unlike that which existed four years ago when I appeared here in support of the FY 1963-67 program and the FY 1963 budget. At that time we were uncertain as to how the Berlin crisis would evolve and we assumed for budget purposes that the special measures associated with that crisis would terminate at the beginning of the next fiscal year. During most of the Korean War, it was assumed for budget purposes that the conflict would end before the beginning of the next fiscal year. And, when President Eisenhower in early 1953 extended this assumption to include the next fiscal year (FY 1954), the conflict ended in the first month of that year. So it is clear there is no "right" way to deal with this kind of problem. The essential point is that the planning assumptions underlying the FY 1966-67 budget requests should be clearly understood by all concerned.

Because of the large demands of our planned military operations in Southeast Asia, we have stretched out and deferred some programs which are not directly related to our near-term combat readiness. This is particularly true of the non-combat portion of the military construction program, e.g., the replacement of administration and school buildings, BOQ's, barracks, etc., not related to the support of our military operations in Southeast Asia. It is also true of the Family Housing construction program, where we have deferred the 8,500 units funded in FY 1966 for the time being and have not included any further request for new units in the FY 1967 budget. As you know, I have fought very hard for adequate military family housing, and this stretch-out should not be construed as a loss of interest on my part. It is simply the kind of program that can be deferred without adversely affecting our near-term combat readiness.

Needless to say, we are pursuing our Cost Reduction Program with renewed vigor. And, as you know, we have developed another list of base closings and consolidations. These actions have been very carefully reviewed by each of the Military Departments in the light of our requirements in Southeast Asia. They will in no way affect our combat capabilities in Southeast Asia or elsewhere.

By eliminating unneeded and marginal activities and deferring whatever can be safely deferred, I have been able to reduce the FY 1966 supplemental and FY 1967 budget requests of the Services and Defense Agencies by about $15½ billion, while at the same time providing for all essential military requirements.

We are requesting for FY 1966 a total of $63.3 billion in new obligational authority, of which $12.3 billion is in the Special Supplemental for Southeast Asia requirements, and $.9 billion is for the pay raises enacted last year. For FY 1967 we are requesting a total of $59.9 billion in new obligational authority. Expenditures for these two fiscal years are now estimated at $54.2 billion and $58.3 billion, respectively. . . .

Impact of the Defense Program on the Balance of Payments.

The persisting deficit in the U.S. international balance of payments and the contribution which our defense expenditures abroad make to that deficit continue to be of major concern. In CY 1964 the overall deficit was about $2.8 billion, with about $1.3 billion occurring in the last quarter of the year. However, as a result of the actions initiated by the President last February, we now expect that when final data are available for 1965, they will show a substantial improvement over 1964. For the first three quarters of 1965, the deficit ran at an annual rate of less than half of the 1964 figure. Further progress in reducing the deficit is anticipated this year as the recently announced, intensified program is implemented.

In the case of Defense, our objective is to reduce the net impact of our programs on the balance of payments, while maintaining all necessary combat capabilities and without creating undue hardships for the individual serviceman or his dependents. As shown in the table below, we have made substantial progress during the last few years in reducing the deficit on the "Defense" account.

Last year I stated that we hoped to reduce further the net adverse balance on the "Defense" account to an annual rate of about $1.4 billion. Despite increased overseas military expenditures associated with activities in Southeast Asia during the last half of the year, we were able to achieve that goal in FY 1965. The reduction since 1961 stems principally from increased receipts from military sales—a direct result of a greatly intensified effort in this area. During this period Defense foreign exchange expenditures were held relatively constant in spite of substantial wage and price increases overseas. For example, between 1961 and 1964 wage levels in

the cost of our deployments overseas —between FY 1961 and 1965 these and other increases would have added about a half a billion dollars to our expenditures had they not been offset by such actions as the following:

- U.S.-produced supplies and services are generally favored whenever their cost, including transportation and handling, does not exceed the cost of foreign goods by more than 50 percent. Through FY 1965, about $250 million of such procurement was diverted to U.S. sources.

- Offshore procurement for the Military Assistance Program is generally limited to the fulfillment of commitments made in prior years. In FY 1965, foreign purchases of major items for MAP were approximately $65 million, little more than half the FY 1964 figure.

- In FY 1964 and FY 1965 we reduced the number of foreign nationals employed by the Department of Defense by approximately 35,000, about a 15 percent reduction during the two years. The staffs of U.S. military headquarters overseas were also reduced about 15 percent.

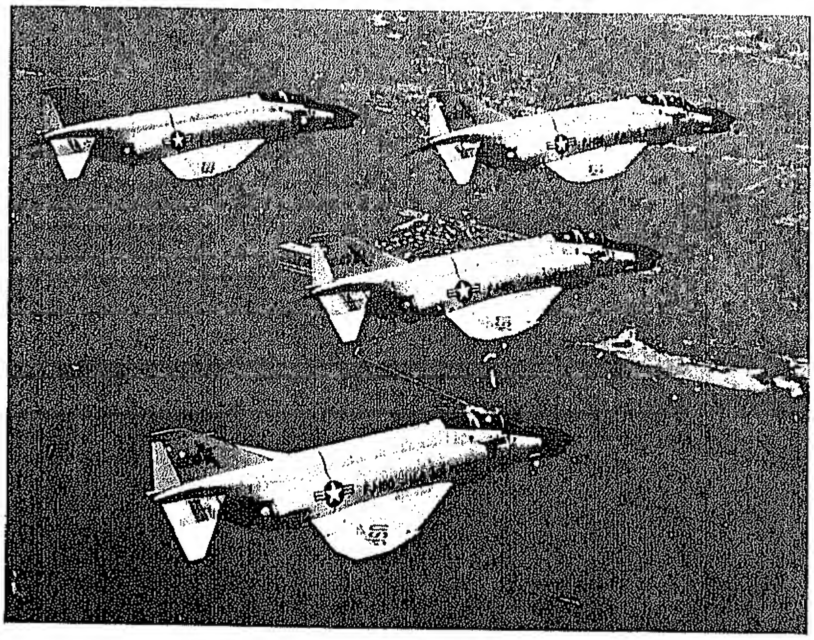
- We are adjusting our forces deployed abroad to changes in our own military capabilities and those of our allies, whenever possible. For example, during FY 1964 and 1965, we completed the phase out of the B-47 bomber force in Europe and the transfer of certain air defense responsibilities to the forces of Spain and Japan.

- We have eliminated all but the most essential overseas construction from our programs and are reducing the foreign exchange cost of those approved projects by requiring the use of U.S. construction contractors, U.S. flag carriers and U.S.-produced materials whenever practicable.

- We are closely scrutinizing the requirement for all existing overseas bases and facilities and are attempting through consolidation and inactivation to reduce their costs to a minimum. . . .

We also are making an intensified effort to maintain and, if possible, increase the level of receipts from military sales. Since the end of FY 1961, orders, commitments and options for over $9 billion of U.S. military equipment and services have been obtained. In addition to their balance of payments benefits, these sales make a positive contribution to the overall defense posture of the Free World by providing our allies with modern equipment at a cost far less than it would cost them to develop and produce it themselves. Moreover, these sales add to our own economic well-being. For example, they will provide almost $1 billion in profits to U.S. industry and over one million man-years of work to American labor.

Purchases by the Federal Republic of Germany under its military offset agreement remain the most significant in terms of total dollar amount. During the past year, however, we have consummated several other significant sales, most notably with Australia, Italy and the United Kingdom. Australia will purchase about $350 million worth of U.S. military goods and services over the next three years including C-130's, P-3's and S-2E's.


U.S. Air Force F-4C Aircraft.

Last December, arrangements also were completed with Italy for the co-production and purchase of about $200 million of military equipment, including the all-weather F-104 aircraft. The United Kingdom during FY 1965 signed orders for nearly $500 million of U.S. equipment, including C-130 transports and F-4 fighter aircraft. In addition, the U.K. took options on additional F-4 and F-111 aircraft.

Because of the size of its potential military procurements from the United States and their balance of payments affects, the United Kingdom has asked us to search out the types of military equipment we plan to buy for which British firms might compete. This would enable them to earn a part of the dollar exchange needed for their possible F-111 procurement from the United States. Early this year we expect to request bids from U.S. and U.K. firms for 11 small non-combatant ships having a total value in terms of foreign exchange of about $50 million. I think it should be clear to all that our future ability to negotiate additional sales programs will depend, at least in part, on our demonstrated willingness to make some reciprocal purchases where foreign equipment is competitive in price, quality and delivery schedules.

Presently, the outlook for Defense-related foreign exchange expenditures is clouded by the situation in Southeast Asia. While we are taking every reasonable measure to reduce their impact, our increased activities in that area will, indeed, result in higher balance of payment costs. Our tentative estimate is that such costs may increase by several hundred million dollars in FY 1966, solely because of Vietnam-related actions. If it were not for the measures we are taking, these costs could be much higher. For example, the bulk of the materials and equipment being used in our large construction program in Vietnam are coming from the United States. Also, we are increasing substantially the number of U.S. military construction battalions used for this work.

This set-back to our effort to reduce foreign exchange expenditures makes it even more important to find offsetting actions. To this end, we have again bolstered our sales effort, and I can assure the committee that we will continue to scrutinize very closely every overseas military activity and function which involves expenditures abroad.

Strategic Offensive and Defensive Forces

Included in this section are the two major programs which constitute our general nuclear war forces: the Strategic Offensive Forces and the Strategic Defensive Forces, including Civil Defense. Because of the close interrelationship and, indeed, the interaction of these components of our general nuclear war posture, it is essential that they be considered within a single analytical framework. Only then can the nature of the general nuclear war problem in all of its dimensions be fully grasped and the relative merits of available alternatives be properly evaluated.

The General Nuclear War Problem

Last year I pointed out that the general nuclear war forces should have two basic capabilities:

• To deter deliberate nuclear attack upon the United States and its allies by maintaining, continuously, a highly reliable ability to inflict an unacceptable degree of damage upon any single aggressor, or combination of aggressors, at any time during the course of a strategic nuclear exchange, even after absorbing a surprise first strike.

• In the event such a war nevertheless occurred, to limit damage to the population and industrial capacity.

The first of these capabilities we call Assured Destruction and the second Damage Limitation. . . .

Strategic Offensive Forces

The force structure proposed for the FY 1967–71 period is shown on the classified table provided to the Committee.

The Maintenance of an Effective Manned Bomber Force in the 1970's.

. . . We propose to phase out the B-52C–F's over the next five years and the B-58's in FY 1971, giving us a modernized force of 465 manned bombers (210 FB-111A's and 255 B-52G–H's) by the end of that fiscal year and at less than the cost which would result from maintenance of the older B-52's and the B-58's in the force. . . .

Although we still cannot see a clear need for a new strategic bomber to replace the B-52G–H's and FB-111's, we plan, as a hedge against some unforeseen improvement in Soviet anti-bomber defenses, to continue development work on the components and sub-systems which would be required if it should ultimately become desirable to deploy such an aircraft. Last year we proposed a four-part program for an advanced manned strategic aircraft (AMSA) which included work on alternative design approaches, the avionics, the propulsion system and the short range attack missile, SRAM. For the first three elements of this program we envisioned a 1966 effort costing $39 million—$24 million from prior year funds and $15 million from FY 1966 appropriations. In acting on our requests, the Congress added $7 million specifying that the total of $22 million provided in FY 1966 was to be available for AMSA. All of this additional $7 million has been applied to the program. Advanced development work on the airframe design and propulsion elements can be continued in FY 1967 with funds already on hand. The avionics development will require an additional $11 million in FY 1967.

Air Launched Missiles.

Last year we initiated development of SRAM as an element of the four part AMSA program. Now, given the decision to proceed with the procurement and deployment of the FB-111/SRAM system, this development program must be reoriented to the FB-111 schedule. The cost to complete the SRAM development program is now estimated at $170 million, including the related B-52 and FB-111 avionics. Some $8 million was provided in prior years; about $40 million will be needed in FY 1967.

Although we do not now plan to deploy SRAM on the B-52G–H's, we propose to undertake the necessary avionics development work to permit such a deployment if it should become desirable later. We would expect to keep the Hound Dog missiles in the operational inventory through FY 1970 on the same schedule as envisioned a year ago. However, in 1971, with the completion of the phase out of the B-52C–F's, the Hound Dog force would be phased down accordingly. We also propose to undertake engineering development and test of a new terminal guidance system for Hound Dog which gives promise of achieving a better overall system reliability. Total development cost is estimated at $20.5 million of which $6.6 million would be obtained by reprogramming presently available funds and $8.1 million is included in the FY 1967 budget. . . .

The cost of the manned bomber force we now propose, compared with the cost of continuing the current forces, is shown in the table below.

Strategic Reconnaissance.

The strategic reconnaissance force as shown on the classified table is essentially the same as that projected a year ago. All of these aircraft were procured in prior years.

Strategic Missile Forces.

Qualitative Improvements to the Minuteman Force. . . . We are now making certain further major improvements in the Minuteman which will so increase its performances as to warrant a new designation—Minuteman III. The initial procurement of this missile will be made in FY 1967.

We still plan to continue the 54 Titan II missiles in the force throughout the program period.

By the end of the current fiscal year, we expect that 32 Polaris submarines (512 missiles) will be op-

	FY 1967	FY 1971	FY 1975
Current Force Extended	(Costs in Billions of Dollars)		
Forces (# aircraft):			
B-52	600	600	600
B-58	80	70	64
Costs (Cumulative '67–)		$8.6	$17
Proposed Bomber Force			
Forces (# aircraft):			
B-52	600	255	255
B-58	80	0	0
FB-111	0	210	210
Costs (Cumulative '67–)		$8.4	$14

erational and, by the end of the 1st quarter of FY 1968, the entire planned force of 41 submarines (656 missiles) will be operational. The force will then consist of 13 SSBN's with A–2 missiles and 28 SSBN's with A–3 missiles. All five of the earlier A–1 boats will have been retrofitted to carry the A–3 missile. We also tentatively plan to modify four of the A–2 submarines during their first overhaul in the FY 1968-69 period to carry the A–3 missiles, in order to avoid the high unit costs which would be involved in restarting the A–2 missile production line (which closed down in June 1964) when present inventories are depleted by testing and training programs.

Accelerated Development of Poseidon. . . . it appears prudent at this time to place ourselves in a position to deploy a force of Poseidon missiles if this should be required. Last year we initiated project definition for this missile, using available 1965 funds, but the pace of the development was not precisely established. Now we propose an accelerated engineering development program for the Poseidon missile. The total cost of this development is estimated at about $1.3 billion, of which about $300 million will be needed in FY 1967. No decisions need be made now on the number of Polaris submarines to be ultimately retrofitted with Poseidon.

With respect to other future strategic missile systems, both the Air Force and the Navy have active study programs under way. The Air Force will continue work on several projects which would contribute to the development of an advanced ICBM, if one should be required at some time in the future. In total, some $10 million is required for FY 1967 for these projects. The Navy will conduct an advanced development study of improved propulsion systems for future sea-based missiles at a FY 1967 cost of $3 million.

Accelerated Development of Penetration Aids. . . . We have intensively studied a wide variety of penetration aid techniques and have invested a total of about $1.2 billion on research and development in this area. We now propose to carry this work forward on an accelerated basis, particularly with regard to the development of new penetration aids, which would be needed to defeat an area ABM defense employing exoatmospheric missiles.

Other Strategic Offensive Forces.

The other strategic forces are essentially the same as those programmed a year ago. With respect to the KC–135's, as the total size of the bomber force declines we intend to retain one tanker for each of the bombers. Most, if not all, of the remainder will be used to improve the air-to-air refueling capabilities of the tactical air forces. However, the specific re-allocation of these KC–135's will be made as they become available for reassignment.

With respect to the Post Attack Command and Control System (PACCS), a number of C–135's have been added to the force planned last year. These aircraft have previously been used principally as refueling tankers with a secondary mission as communications relay aircraft. In 1963, anticipating the time when we might no longer be sure of the survivability of our ground-based missile launch control facilities, we undertook the development of an airborne launch control capability for all of the Minuteman force. The development costs of the necessary equipment through FY 1967 is estimated at $18.6 million. We now propose to begin procurement of the airborne portion of this equipment in FY 1966 at a cost of approximately $22 million. The ground portion of the airborne launch control capability is included as an integral element of the Minuteman program.

Strategic Defensive Forces

The forces proposed for the FY 1967–70 period are shown in the classified table furnished to the committee.

The Overall Level of the Anti-Bomber Defense Program.

As I have pointed out in previous years, the elaborate defenses which we erected against the Soviet's bomber threat during the decade of the 1950's no longer retain their original importance. Today, with no defense against the major threat of Soviet ICBM's, our anti-bomber defenses alone would contribute very little to our Damage Limiting objective and their residual effectiveness after a major ICBM attack is highly problematical. For this reason we have been engaged over the past five years in a major restructuring of these defenses.

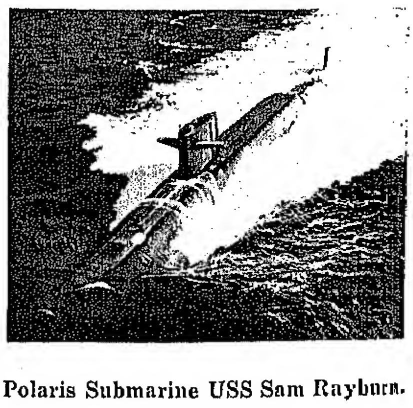
Surveillance, Warning and Control. Beginning in 1961, we have taken a number of steps to reorient the surveillance, warning and control system to a nuclear war environment in which an early surprise attack by ICBM's and SLBM's would be the most likely enemy tactic. These steps were designed to reduce the vulnerability of the system to such an attack and to bring its operating costs to a level more commensurate with the manned bomber threat as it has actually developed.

Semi-Automatic Ground Environment System (SAGE). Essentially soft, the SAGE system in 1961 was extremely vulnerable to missile attack. To provide immediate help, an interim manual backup interceptor control capability was established at 27 prime radar sites while work was initiated on a more effective backup system of 34 semi-automatic BUIC II stations co-located with prime radars. . . .

The first BUIC II's became operational last fall and all 14 of those now planned will be operational by April this year. In FY 1967 we will begin to modify certain of these stations to the BUIC III configuration, thereby causing a temporary drop to 12 operational stations at the end of that year. By the end of FY 1968, all BUIC II's will have been converted and by end FY 1969, the entire BUIC III deployment should be complete.

Radars. . . . We are continuing our program of internetting our radar system with that of the Federal Aviation Agency. . . . The Defense Department's share of this program is estimated at $22 million, of which $11 million was included in the FY 1966 budget, leaving $11 million to be provided in FY 1967.

Manned Interceptors. Last year, as part of the effort to restructure the Strategic Defensive Forces, we initiated a major phase down of the active fighter interceptor force, with the National Guard interceptor force remaining at about the current level but being progressively re-equipped with F–102's retired from the active force. This plan has now been projected through FY 1971 with no significant change. . . .



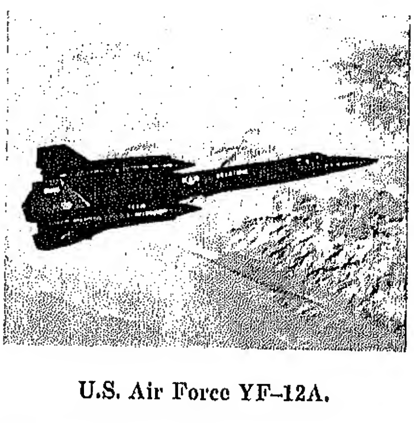
Polaris Submarine USS Sam Rayburn.

Surface-to-Air Missiles. With the exception of the Hercules, the surface-to-air missile forces are essentially the same as those projected a year ago. In the case of Nike-Hercules, we have decided to phase out 22 batteries deployed in defense of soft SAC bomber bases in the United States and Greenland. . . .

Qualitative Improvements to the Anti-Bomber Defense.

Production and Deployment of a New Manned Interceptor. Last year I pointed out that the single most important decision likely to face us over the next few years in the anti-bomber defense area is the production and deployment of a force of the advanced fighter-interceptor aircraft to replace those which we now have. Over the last 12 months we have intensively studied the desirability of procuring a force of F-12 type interceptors for the period beyond 1970. Although a substantial deployment of these aircraft would greatly increase the effectiveness of our anti-bomber defenses, its very great cost (about $6½ billion over the 1967-71 period) would be justified only if we were to decide to seek a very large and effective Damage Limiting program, and then only if the Soviets were to increase their bomber threat in both numbers and quality.

Accordingly, we propose to continue the YF-12A flight test program with the three aircraft now available. We have allocated $23 million to the YF-12A program in the current fiscal year, plus $5 million to the F-12 program for certain improvements in the ASG-18/AIM-47 fire control and missile system. For FY 1967, we are requesting $20 million for the YF-12A test program and $10 million for continuing the F-12 program. The ASG-18/AIM-47 system would be used on either the F-12 or F-111 interceptor. I believe that with either of these aircraft, we could proceed expeditiously with the deployment of a new interceptor later in this decade if that should prove necessary.



U.S. Air Force YF-12A.

If we decide to deploy a force of advanced interceptors, we would also wish to consider the simultaneous deployment of a highly survivable airborne warning and control system (AWACS) in the continental defense role. Moreover, an effective airborne interceptor control system would find important application in tactical situations. For these reasons, we initiated two years ago the study of such a system. Five million dollars were provided for FY 1966. We are now requesting $3 million for FY 1967 to undertake a contract definition phase for a development prototypes of the aircraft itself. A complementary program to develop the overland radar technology, which is critical to the successful development of AWACS, is funded at $9 million in FY 1966 and $12 million more is requested for FY 1967.

Improved Surface-to-Air Missiles. Our FY 1967 budget request provides for the continued development of improvements to the Hawk missile system with a view to decreasing its reaction time, speeding up its target-handling capability and improving its reliability. It also provides for the continued development of an advanced air defense system as a possible replacement for both Hawk and Hercules in the 1970's. This effort, now designated SAM-D, and the Hawk improvement program are also oriented to the theater air defense problem and will be discussed further in connection with the Army's General Purpose Forces.

Ballistic Missile Warning and Defense.

Defense against ballistic missiles, once they are launched from submarines or land bases, comprises the capabilities for detecting, tracking, intercepting and destroying the incoming warheads.

Ballistic Missile Early Warning System (BMEWS). . . . The modification of certain SAGE and Spacetrack radars on the East, West and Gulf Coasts to give them a limited detection capability against sea-launched ballistic missiles, which I mentioned last year, is progressing on schedule. The $19 million already programmed should essentially complete this program.

Over-the-Horizon Radar. Last year I described our development of an over-the-horizon radar system capable of the remote detection of missile launches. This development was undertaken to provide increased confidence in BMEWS warning, to extend the warning time itself and to prevent a Soviet "end run" of BMEWS. Through FY 1966, about $42 million has been programmed for over-the-horizon radars; and another $23 million is included in the FY 1967 budget.

The Character and Timing of a Deployment of ABM Defense. . . . In the coming fiscal year, we propose to carry forward this entire broadened Nike X development, test and evaluation effort, including the Sprint missile; the new, long-range exoatmospheric interceptor; the new family of radars; and the construction of test facilities. Some $447 million has been provided in our 1967 Budget request for this program. In addition, $119 million has been included for the related Defender program, which is concerned with vehicle re-entry measurements and analysis, advanced ABM techniques and devices and system studies.

With respect to the defense of hard point targets, we have had for some years a multi-pronged effort to develop the concepts and the components for an advanced weapon system. The two major elements of this effort are Hi-Bex—an extremely high acceleration missile interceptor — and Hapdar — a complementary phased array radar. These projects have already been funded, a number of interceptor tests have been made and the test just recently begun to operate. Over the next several months we will be studying and evaluating the data from these tests.

Anti-Satellite Defense.

Detection and tracking of foreign satellites is performed by the Space Detection and Tracking System (SPADATS). SPADATS acquires information from three separate sources: the Navy's SPASUR detection fence extending across the southern United States; the BMEWS screen across the northern approaches; and Spacetrack, the worldwide network of radars and optical sensors. The principal investment now contemplated for SPADATS is the construction of a large phased array radar at Eglin Air Force Base.

We are also providing two large ground based optical installations for satellite tracking and photography. The one at Cloudcroft, New Mexico is already operational, and the other at Maui, Hawaii, will become operational shortly. . . .

Civil Defense

The last of the seven major issues involved in our FY 1967-71 general nuclear war program concerns the

future size and scope of the Civil Defense program. Considering the great uncertainties regarding the other elements of the Damage Limiting program, I do not believe that we should undertake, at this time, any major change in our present civil defense effort. Therefore, with but one exception, the program I am recommending this year is essentially the same as the one approved by the Congress for FY 1966.

The principal innovation proposed for FY 1967 is a modest experimental program designed to stimulate the use of construction techniques in new public non-federal or privately owned buildings which would at little or no extra cost, provide dual-use fallout shelter space. . . . I believe that this experimental program is a sound and logical step in our overall civil defense effort, and I urge the committee's support of our $10 million budget request for this purpose. . . .

Shelter Survey.

. . . To continue all of these shelter survey activities, $23 million is requested in the FY 1967 budget.

Shelter Development.

. . . To date, pilot Community Shelter Plans are under way in 57 areas and plans will be started in 200 areas during the current year. For FY 1967, $4 million is requested to extend this planning effort to another 200 areas. . . .

. . . We propose in FY 1967 to continue our efforts to provide the necessary architectural and engineering advice to the construction industry, at a cost of about $3 million. . . .

Shelter in Federal Buildings.

No additional funds are requested this year specifically for Regional Emergency Operating Centers or for single purpose shelter space in Federal buildings. . . .

Shelter Provisions.

No funds are being requested for shelter supplies in FY 1967, except for $800,000 to be used for special protective packing for shelter supplies placed in mines, caves and tunnels and to initiate a quality check of shelter stocks already in shelters.

The balance of the $6.8 million shown for Shelter Provisions is for ventilation kits. . . . Procurement of a test quantity of 2,400 units is being made this year. The $6 million included in the FY 1967 budget would provide a sufficient number of kits to make habitable another 2.8 million shelter spaces at a cost of a little more than $2 per space.

Warning.

The $700,000 requested under this heading is to continue the development effort on a radio system for indoor warning.

Emergency Operations.

For FY 1967, $13.1 million is included for the Emergency Broadcast System, damage assessment, radiological defense, emergency operations systems development and technical support (primarily for communications and warning).

. . . About $1.4 million is included in the FY 1967 budget to complete the equipping of the remaining 59 stations and the related remote radio pick-up units.

Operation of the National Civil Defense Computer Facility and support of the damage assessment capability will require $1.5 million in FY 1967; and $6.7 million is needed for procurement of 1,000 aerial survey meters for monitoring radiological fallout, engineering improvement of radiological instruments, and for weather services, warehousing and radiological instrument maintenance and calibration.

The balance of $3.5 million is required for emergency operations systems development—i.e., the application of results of research, engineering tests and operations analyses to the solution of practical civil defense problems, and for communications advisory services and operation of the regional communications centers.

Financial Assistance to States.

. . . $30.5 million in matching funds are requested for FY 1967 for financial assistance to the States. . . .

Research and Development.

The $10 million requested for civil defense research and development will enable us to continue our efforts to obtain: fallout protection at lower costs per shelter space; better means of warning the population and of controlling and directing emergency operations in damaged areas; an improved technical base for post-attack survival and recuperation; and improved data on the countermeasures against all effects of nuclear weapons. . . .

Management.

For overall program management, $13.2 million is requested for FY 1967. . . .

Public Information.

The $4 million requested for FY 1967 is for the preparation of emergency information, instruction, dissemination of technical information and for programs to encourage the participation of industry in civil defense activities.

Training and Education.

The $15.6 million included under this heading will permit a continuation of the University Extension Program which provides professional civil defense training through the state university and "land-grant" college systems . . . adult education and rural education programs. The latter program provides instruction for farm families on how to protect themselves and their livestock against fallout.

Financial Summary

The Strategic Offensive Forces, the Strategic Defense Forces and the Civil Defense Program I have outlined will require Total Obligational Authority of $6.5 billion in FY 1967. A comparison with prior years is shown below:

($ Billions, Fiscal Years)

	1962 Orig.	1962 Final	1963 Act.	1964 Act.	1965 Act.	1966 Est.	1967 Prop.
Strategic Offensive Forces	7.6	8.9	8.3	7.3	5.3	5.1	5.1
Strategic Defensive Forces	2.2	2.0	1.8	1.9	1.5	1.6	1.3
Civil Defense	—	.3	.1	.1	.1	.1	.1
Total	9.8	11.2	10.2	9.3	6.9	6.8	6.5

General Purpose Forces

The General Purpose Forces include most of the Army's combat and combat support units, virtually all Navy units (except for the Polaris forces,), all Marine Corps units, and the tactical units of the Air Force. These are the forces upon which we rely for all military actions short of general nuclear war, i.e., limited war and counterinsurgency operations.

The Requirements for General Purpose Forces

Last year I discussed in some detail the nature of the limited war problem and our requirements for General Purpose Forces. I believe it would be useful, as a framework for your consideration of our present program proposals in this area, to summarize the main points of that discussion:

• The distinction between general nuclear war forces and limited war forces is somewhat arbitrary in that all of our forces would be employed in a general war, and certain elements of our strategic offensive-defensive forces could be employed in a limited war; and, indeed, we are today using some of our B-52 strategic bombers against the Viet Cong and North Vietnamese forces in South Vietnam. But it is primarily the limited war mission which shapes the size and character of the General Purpose Forces.

• The requirement for the bulk of these forces stems from this nation's commitment, in our own security interest, to the principle of collective defense of the Free World. . . .

• Forces must be provided for the direct defense of U.S. territories and vital interests, i.e., the protection of U.S. shipping on the high seas, the defense of the Canal Zone, Puerto Rico, etc.

• Each of these commitments could give rise to contingencies for which we must plan and provide military capabilities. We cannot hope to anticipate and be fully prepared for every conceivable contingency and, for that matter, neither can our opponents. Moreover, the likelihood of predicting contingencies in any degree of detail is, as we repeatedly discover, quite small. Accordingly, we must build into our General Purpose Forces a capability to deal with a very wide range of contingencies . . .

• Because of the close interrelationship between our forces and those of our allies in the collective defense of the Free World, it is in our own interest to help them support adequate forces wherever they cannot do the job alone. For this reason I have always considered Military Assistance an integral part of our own defense program.

• The ability to concentrate our military power rapidly in a threatened area can make a great difference in the size of the force ultimately required and, in some cases, can serve to halt aggression before it really gets started. That is why we have given a great deal of attention in recent years to the various ways of reducing our reaction time to limited war situations—airlift, sealift, prepositioning of materiel, etc.

• The currently planned expansion of our airlift, together with the improvement in our sealift and increases in prepositioned equipment, will enable us within a few years to move most of our central reserve of active ground forces overseas within 30 to 60 days. Thus, to be of maximum value in the kind of limited war situations we see ahead, the readiness of reserve components units should be brought to a level which would permit their deployment within that time.

Another aspect of the General Purpose Forces problem which I discussed with the Committee in considerable detail last year was the role of tactical nuclear weapons in a limited war in Europe. I pointed out that our studies in this area were still highly tentative, but that certain preliminary conclusions were warranted. Further study has advanced our understanding of this extremely difficult and complex problem, but our conclusions must still be considered tentative. . . .

With respect to the Far East, we must distinguish between the Soviet and Chinese communist threats. Our present nuclear predominance combined with a strong conventional defense posture in the area is now and should continue to be fully adequate to deter deliberate Soviet aggression, nuclear or non-nuclear.

The Chinese communists, however, will present a different kind of problem in the years ahead. The full implications of this new threat in the Far East are as yet far from clear, and the question of what our theater nuclear posture in the Far East should be in the future will require continuing study. In this connection, there is one lesson that we can draw from our experience in Europe, and that is to avoid a strategy which relies almost wholly on the use of tactical nuclear weapons to cope with the enemy's "massive" ground forces.

Capabilities of the Programmed Forces

As I noted earlier, our General Purpose Forces requirements are derived from analyses of contingencies, including the support of our allies around the world. Accordingly, our General Purpose Forces capabilities must be assessed in conjunction with the capabilities of these allied forces. Although we have considerable knowledge of the force plans of our allies, we cannot be sure how they will change with the passage of time. This creates some uncertainty about the specific requirements for U.S. forces in the more distant years of the five-year programming period, for which we must make allowances in our force planning.

The largest potential requirement for U.S. General Purpose Forces relates to a non-nuclear war in Europe. But the most immediate requirement today relates to our military effort in Southeast Asia. I believe it would be appropriate, therefore, to discuss the latter requirement first.

Southeast Asia.

. . . Now I would like to review with you the military aspects of the situation in Southeast Asia, our objectives there, and how we plan to achieve them.

We are dealing here with an immensely complicated problem, involving not only our immediate and longer range miltary objectives, but U.S. foreign policy and local political, economic and social considerations as well. While the military task in Vietnam is still largely a counterinsurgency effort, it is in many other respects a conventional limited war against external aggression. This is so because the communist aggression against South Vietnam is directed, controlled and supported by the government of North Vietnam, not only with men, materiel and money, but with its own regular military forces as well. Moreover, North Vietnam itself is receiving substantial materiel support (but, as yet, no combat forces) from Communist China and, indeed, is being pressured by that country to continue the conflict. North Vietnam is also receiving important materiel support from the Soviet Union, including ground-to-air missiles.

However, the struggle in South Vietnam has not only become a major test case of the communists' doctrine of the so-called "wars of national lib-

eration," it has also become a test case between the Soviet and Chinese communist versions of that doctrine. As I pointed out earlier, according to Chinese communist doctrine, Vietnam is now the main focus of their campaign to subvert by violence independent nations in Asia, Latin America and Africa. The Soviet Union, apparently, would prefer to achieve the same goal by less violent means.

We must also take into account, in formulating our military objectives and operational plans for Vietnam, the unique character of that conflict. Since it is basically a war of terror and subversion, supported and directed from without, there are no established lines across which armies face armies with each side having well-defined, contiguous areas under its control. Instead, the territory of South Vietnam is controlled in varying degrees by the government and by the communists. Some areas are firmly under the control of the government, some under the control of the communists, and still other areas are controlled by neither side. This requires that our military efforts in South Vietnam consist of widely dispersed military operations directed at the scattered and changing areas of communist control.

As I noted in my appearance before this committee last August, the communists had apparently decided by early 1965 to make an all-out attempt to bring down the legitimate government of South Vietnam. The entire economic and social structure was brought under attack. Agricultural products were barred from the cities. Electric power plants and communications lines were systematically sabotaged. Whole villages were burned and their inhabitants driven away, increasing the refugee burden on the government of South Vietnam.

This onslaught has taken its toll. The economy of South Vietnam is, indeed, now in serious difficulty. The social structure has been disrupted and hundreds of thousands of people have to be resettled and given gainful employment. These problems cannot be solved by military means alone. Indeed, our economic aid effort at this time is at least as important as our military effort, not only in keeping South Vietnam viable as a nation but also in helping consolidate the gains of that military effort.

Policy Objectives and Military Tasks in Vietnam. Our overall policy objective in South Vietnam is a stable and independent government free of communist control. Our immediate objective is to force the communists to move the conflict from the battlefield to the conference table. The basic tasks which flow from these objectives are:

- To support the re-establishment of the authority of the government of South Vietnam over its territory.
- To exert pressure on the government of North Vietnam to cease its direction and support of the communist insurrection in South Vietnam.
- To deter Communist China from direct intervention in the conflict in South Vietnam and to defeat such intervention if it ocurs.

The following concept of military operations has been developed in collaboration with the South Vietnamese military command. The ground forces —United States, Korean, Australian, New Zealand, as well as South Vietnamese — will conduct four major types of operations which broadly overlap one another;

- "Search and destroy" operations, designed to destroy known or suspected communist forces and their base areas (supplies, communications and installations). These operations are not intended to seize and hold territory permanently.
- "Clear and secure" operations to eliminate, permanently, residual communist forces from specified limited areas. These operations are designed to hold territory and are undertaken only when it is considered possible to conduct, on a continuing basis, the full range of pacification measures required to secure the area.
- "Reserve reaction" operations designed to relieve provincial capitals and district towns under communist attack and to reinforce friendly forces when needed.
- Defense of government centers, including the protection of provincial capitals, district towns, key governmental facilities and installations.

The strike elements of the regular South Vietnamese forces, together with U.S. and other Free World forces (i.e., Korean and Australian/New Zealand) are concentracting on the first type of operation. The South Vietnamese forces, with some assistance from U.S. and other Free World forces, particularly in areas contiguous to their own bases, are assuming primary responsibility for the second type of operations. The third type is again primarily the responsibility of the South Vietnamese forces with such help as may be required from U.S. and other Free World forces. The fourth type is essentially the responsibility of the South Vietnamese forces.

I want to reiterate that the foregoing allocation of responsibilities is very general and, in actual practice, will vary according to the particular circumstances. A maximum degree of flexibility is needed to deal with the very fluid military situation which exists in South Vietnam.

The regular South Vietnamese ground forces are being assisted in the "clear and secure" and the "defense of government centers" operations by the "Regional" forces. The "Popular" forces are assisting at the village level in providing long-term security in areas already cleared by the regular combat forces and the "Regional" forces. The "Popular" forces are also participating in the pacification task. The re-establishment of normal governmental functions is primarily the responsibility of the civil authorities and the national police.

The air forces (USAF, USN, USMC and VNAF) are conducting close support air strike, suppressive fire, airlift and reconnaissance operations in support of the ground forces and reconnaissance and strike operations in support of the interdiction mission, including sea surveillance. Our concept of operations calls for a massive application of airpower in every form. This is also true in the case of artillery. In effect, we are trying to substitute, to the maximum extent feasible, the expenditure of materiel in place of the expenditure of our manpower. For example, in the case of ammunition, we have added to the \$1.1 billion included in the original FY 1966 budget, \$800 million from the August amendment and \$2.1 billion from the FY 1966 supplemental—giving us a total of about \$4.1 billion for ammunition in FY 1966. And, another \$3.7 billion for ammunition is included in the FY 1967 budget. . . .

The Communist Forces in South Vietnam. When, I appeared before this Committee last August in support of the Amendment to the FY 1966 Defense Budget, I said:

> "We now estimate the hard core Viet Cong strength at some 70,000 men, including a recently reported increase in the number of combat battalions. In addition, they have some 90,000 to 100,000 irregulars and some 30,000 in their political cadres, i.e., tax collectors, propagandists, etc. We have also identified at least three battalions of the regular North Vietnamese Army, and there are probably considerably more."

We now believe that the communists' military and paramilitary forces in South Vietnam total over 235,000 com-

pared with the 190,000-200,000 estimated last summer. The communist hard core strength totals about 87,000, the irregulars number about 110,000, and the political cadres about 39,000. Within these totals, the confirmed North Vietnamese regular army forces in South Vietnam now number at least 11,000 men, and there are probably more.

The most significant increase during the last three or four months has been in the North Vietnamese forces; the Viet Cong forces appear to be increasing more slowly than heretofore. As I have noted on previous occasions, these trends were anticipated some time ago. The heavy losses suffered by the Viet Cong during the last six months have made it very difficult for them to raise their strength and the communists have been forced increasingly to rely on the regular North Vietnamese Army in their attempt to match our buildup. For example, during the last half of 1965, Viet Cong combat deaths reached an annual rate at about 47,100 compared with about 16,800 for 1964. Viet Cong captured during this period rose to an annual rate of about 7,300 compared with about 4,200 for 1964 while the rate of known Viet Cong defectors rose to about 12,500 compared with 1,900 in 1964.

We must assume that the number of North Vietnamese regular army troops in South Vietnam will continue to increase substantially in the months ahead as we step up our attacks on the communists' main forces and work to expand the government's control over the population and territory of South Vietnam, thus further limiting their potential sources of supply for indigenous military manpower.

With regard to logistic support, the Viet Cong itself apparently depends upon internal sources for almost all "non-military" supplies, particularly food, clothing and construction materials. It appears that they produce mines and grenades and purchase clandestinely in South Vietnam such items as medicine, storage batteries and other civilian-type goods. But both the Viet Cong and North Vietnamese forces in South Vietnam are becoming increasingly dependent upon external sources of supply (for arms and ammunition, communications equipment, bulk medical supplies, etc.). Particularly important are the 7.62mm rifles and machine guns, grenade launchers, recoilless guns and mortars, and their ammunition. Much of these arms and ammunition is of Communist Chinese manufacture but some of it has been made in the USSR or in Czechoslovakia.

The supply lines from North Vietnam through Laos and South Vietnam are well known, although they are very difficult to interdict. Not so well understood is the source of supplies coming from Cambodia. The borders are so inadequately policed that it is probable the communists are able to infiltrate supplies and troops through that country, both south from Laos and north from the sea. The increasing effectiveness of our sea surveillance leads us to believe that less of the supplies are coming in to South Vietnam directly by sea. . . .

Army General Purpose Forces

During the past year, we have made a number of decisions which affect the size and composition of the Army General Purpose Forces proposed for the FY 1967–71 period.

As you will remember, we conducted a series of field tests during FY 1963 and FY 1964 of new air mobility concepts. Last March, the JCS completed their analysis of these test results, and, in June, on the basis of the JCS recommendations, I authorized the Army to proceed with the organization of a new airmobile division, using the resources of the 2nd Infantry Division and the provisional 11th Air Assault Division which had been temporarily established for the tests. Shortly after forming up last summer, this division was deployed to Vietnam. Completely air-transportable, it has 434 organic aircraft, more than four times the number authorized in a regular infantry division. These aircraft, almost all of which are helicopters, provide such an improvement in mobility and reaction time that entirely new tactics have become possible. On the basis of this division's performance in South Vietnam, we are planning on the conversion of one additional division to the airmobile configuration. Funds have been included in the FY 1966–67 budget to initiate the procurement of long lead time equipment required for this purpose. A date for the conversion has yet to be determined. . . .

Army Procurement.

As I indicated at the beginning of this statement, we have made very heavy investments in Army procurement since FY 1961. Nevertheless, because of the projected consumption in Southeast Asia and the previously discussed force augmentations, the Army procurement programs which we now recommend for FY 1966 and FY 1967 are the largest since the Korean War.

Our present logistics guidance provides that the Army will procure initial equipment for 26⅓ division force equivalents including the 16 permanent and one temporary active division forces, the eight priority reserve forces, four brigade forces and all the related combat, combat support and logistics support units. . . .

Essentially, the FY 1966–67 procurement programs proposed for the Army have been developed to provide for all projected combat consumption in Southeast Asia and to meet in full our war reserve inventory objectives in accordance with the logistic standards just described. The revised FY 1966 program now totals $5,045 million, of which $2,465 million is included in the supplemental request. The FY 1967 program totals $3,561 million. But, again, I want to remind you that for purposes of developing our FY 1966–67 budget requests we have assumed that combat operations in Southeast Asia will continue through June 30, 1967. If it later appears that combat will continue beyond that date, more funds will be needed for FY 1967.

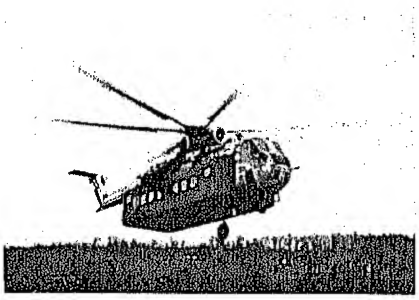
Aircraft. . . . The FY 1966 program now totals $1,333 million for 3,044 aircraft, of which $826 million is included in the supplemental request. The FY 1967 request includes $593 million for 1,532 aircraft.

The largest single aircraft item is the UH–1B/D helicopter, of which we propose to procure very large numbers in both FY 1966 and FY 1967.

We also propose to raise the production rate of CH–47A's in order to speed up the achievement of the inventory objective and provide for projected attrition. The quantities of these transport helicopters proposed in the FY 1966 and FY 1967 requests will satisfy almost all of the Army's total procurement requirement.

The proposed purchases of LOH–6A's in FY 1966 and FY 1967 will permit a stepped up modernization of the observation aircraft inventory.

The FY 1966 supplemental request includes funds for the first operational quantity of CH–54A heavy lift



U.S. Army CH–54A Heavy Lift Helicopter.

helicopters and more are included in the FY 1967 budget request. . . .

We also propose to procure some fixed-wing utility aircraft in FY 1966, as well as a substantial number of trainer aircraft to meet the expanded pilot training requirements of the Army. At this time, no further trainer aircraft procurement is contemplated for FY 1967.

Missiles. Army missile procurement (including spares) will total $369 million in FY 1966 ($64 million in the supplemental request) and $357 million in FY 1967.

The current year's procurement of Pershing missiles will complete the presently planned inventory requirements and provide for training consumption. Funds are included in the FY 1967 budget to finance the procurement of improved ground support equipment.

For Lance, $19 million of available funds will be used in FY 1966 for production tooling and advance production engineering. In FY 1967, we propose to procure a substantial number of the missiles and the associated ground support equipment.

The revised FY 1966 program for Shillelagh includes a large purchase of missiles and the FY 1967 request includes an even greater quantity. . . .

For Redeye, the man-transportable, shoulder-fired air defense missile, the revised FY 1966 program provides for a major purchase of missiles, and the FY 1967 request includes a large additional quantity. These procurements will meet the present tactical inventory objective and provide for training consumption.

The funds requested for Hawk in FY 1967 will provide the necessary ground support equipment for the previously discussed conversion of Hawk battalions to the self-propelled configuration, advance production engineering for the Improved Hawk missile, and modified fire control equipment designed to increase Hawk effectiveness.

The FY 1967 request includes $62 million for the Chaparral missile system. This amount will provide for the procurement of a large quantity of missiles, the self-propelled and towed fire units, and equipment for training and testing the Chaparral.

Weapons and Combat Vehicles. The revised FY 1966 program for weapons and combat vehicles totals $521 million, of which $181 million is included in the FY 1966 supplemental. For FY 1967, $428 million is requested.

As part of the stepped-up program to improve the Army's forward area air defense capability, we are buying this year the first increment of self-propelled Vulcan M-61A 20mm antiaircraft guns to complement the capability of the Chaparral missile. . . . The funds requested for FY 1967 will provide for procurement of more guns together with fire control equipment for both the FY 1966 and FY 1967 programs.

We have also included funds in the FY 1967 budget for the second increment of the Hispano Suiza 20mm guns, as part of the program to upgrade the firepower of our M–114 armored command and reconnaissance vehicle which presently mounts a 50 cal. machine gun. The required quantity of this gun is being procured over a three-year period.

The FY 1967 program includes a substantial number of self-propelled 155mm howitzers and M–578 light recovery vehicles. The 155mm howitzers are replacing the 105mm weapons.

Included also is the second increment of General Sheridan armored reconnaissance and airborne assault vehicles.

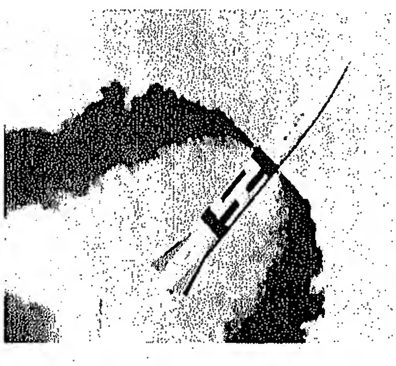
During FY 1967, we plan to maintain a production rate of the basic M-113 chassis sufficient to meet the combined requirements for the self-propelled 81mm mortar carriers and the XM–548 cargo carriers, both of which use this chassis.

The proposed FY 1967 [illegible] provides for the continued [illegible] zation of the Army's tank [illegible] We now plan to retrofit large [illegible] bers of M–48 medium tanks [illegible] diesel engines and 105mm [illegible] procure a number of new [illegible] equipped with the Shillelagh [illegible] gun. Together with a small [illegible] of armored vehicle bridges [illegible] bat engineer vehicles which [illegible] same chassis, the planned M [illegible] procurement will support [illegible] mum sustaining monthly [illegible] rate.

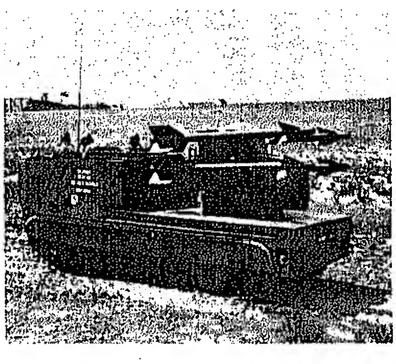
We presently have under [illegible] velopment with the Federal [illegible] of Germany the Main Battle [illegible] now scheduled for introduc[illegible] the operational inventory [illegible] 1970's. In FY 1967, we are [illegible] ing $10 million for advance [illegible] tion engineering. (Funds [illegible] included in the R&D program [illegible] port the U.S. share of this [illegible] ment.)

Tactical and Support Vehicles. [illegible] FY 1966 program for the [illegible] trailers and other non[illegible] cles now totals $608 million [illegible] $253 million is included [illegible] plemental request. For FY [illegible] million is requested for [illegible] including ¼-ton trucks, [illegible] and 1¼-ton trucks, [illegible] and 5-ton vehicles of [illegible] Included in the 1¼-ton [illegible] ment is the Gamma Goat [illegible] vehicle which is composed [illegible] arate tractor and power[illegible] joined together to improve [illegible] mobility. . . . We propose [illegible] first increment of these [illegible] FY 1967.

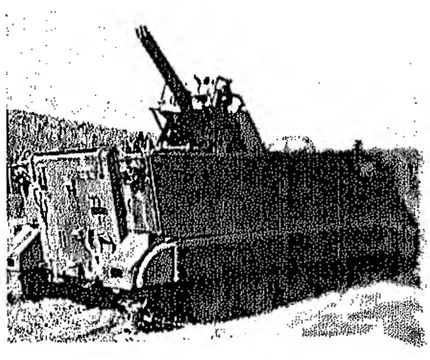
Communications and Electronics. For communications and [illegible] procurement, the FY 1967 [illegible] quest includes $293 mill[illegible] revised FY 1966 program [illegible] $450 million of which $2[illegible] included in the supplemental [illegible]



Lance Ballistic Missile.



Chaparral Launch Vehicle.



20mm Vulcan Weapon System.

The FY 1967 program includes another major purchase of AN/VRC–12 vehicular radios, and the initiation of procurement of some of the radio relay equipment for the Army Area Communications System (AACOMS).

Ammunition. For ammunition, the Army's revised FY 1966 program includes $1,278 million, of which $671 million is included in the supplemental. For FY 1967, $1,052 million is requested.

A large procurement of small arms ammunition (5.56mm and 7.62mm cartridges) is proposed for the current fiscal year to meet projected Southeast Asia consumption. The quantities requested for FY 1967 will fully meet the inventory objective for these items.

We propose to make large purchases of both 20mm and 40mm ammunition in FY 1966. In both FY 1966 and FY 1967 we will procure 20mm ammo for the Vulcan air defense gun and for the Hispano-Suiza gun mounted on the M–114 armored command and reconnaissance vehicle. All of the 40mm ammunition proposed for FY 1966 and FY 1967 are cartridges used with the M–79 grenade launcher and a rapid fire helicopter-mounted version widely employed in Vietnam. Funds are also included in FY 1967 for a new anti-aircraft fuze. This fuze will be fitted on existing 40mm ammo to be used by the "Duster" anti-aircraft units which we are reactivating. . . .

Similarly, most of the large increase in 81mm, 105mm, 106mm, and 4.2 inch cartridges and in 2.75 inch rockets is related to Southeast Asia requirements. The increase in procurement of 152mm ammunition is to build up initial inventories for the new Shillealagh/gun turret on the M–60 tanks and for the gun/launcher on the General Sheridan vehicle. The larger quantities of 155mm ammunition are required to keep pace with the growing inventory of 155mm self-propelled howitzers as well as to provide for increased consumption in Vietnam.

Other Support Equipment. The revised FY 1966 program for other support equipment totals $312 million, of which $195 million is included in the supplemental request. These funds are required for such items as electric field generators, road graders, cranes, tractors, bridge components, shop equipment, fork lift trucks, etc. For FY 1967, $262 million is requested.

Production Base Program. The revised FY 1966 program for production base support totals $174 million, of which $34 million is included in the supplemental request. For FY 1967, $50 million is requested.

Navy General Purpose Forces

Except for the Vietnam augmentations, the major changes in the Navy General Purpose Forces proposed for the FY 1966–71 period from the program envisioned last year concern the attack carriers and their air wings, the anti-submarine warfare forces and the guided missile destroyers.

Attack Carrier Forces.

In my appearance here last year in support of the FY 1966–70 program and FY 1966 Budget, I discussed a plan which would have reduced the attack carrier forces to 13 ships and 13 air wings by the early 1970's. A reduction of this order was considered appropriate for several reasons: the introduction of far more effective ships and aircraft into the Fleet, the release of the attack carriers from the strategic alert mission, and the overall increase in quantity, range and effectiveness of land-based tactical air power generally. Since that time a plan has been developed for the attack carrier forces which I believe is superior to the one discussed last year. Under the new plan, the number of ships would be held at 15 but the number of air wings would be reduced to 12—an increase of two ships and a reduction of one air wing compared with the previous plan. Significantly more useable combat power could be obtained from a force of 15 carriers and 12 air wings than from a force of 13 carriers and 13 air wings, and at no increase in cost. . . .

Ships . . . To provide for the progressive modernization of the attack carrier force, we have included funds for the construction of a new nuclear-powered attack carrier in our FY 1967 request. When this ship is delivered to the Fleet, we will have ten large carriers and three of the Midway-class. Now that we plan to retain a force of 15 carriers, two more new carriers will have to be provided, and these have been tentatively scheduled for later years. These, also, would be nuclear-powered. As these ships are delivered to the Fleet, the Essex-class carriers will be retired from the CVA force which would then consist of four nuclear-powered, eight Forrestal-class and three Midway-class carriers, for a total of 15.

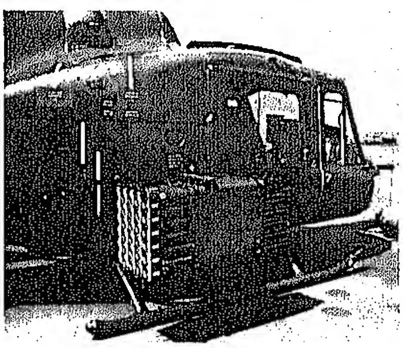
Carrier Aircraft. Approximately 80 percent of the total air complement of the attack carrier forces is currently organized into 15 carrier air wings; the remaining 20 percent is made up of aircraft used for combat readiness training. The decline in the total number of fighters after FY 1967 reflects two factors—the reduction from 15 to 12 wings and the substitution of the F-111B's for other aircraft on less than a one-for-one basis when these aircraft become operational. As I noted in previous years, the F-111B promises a substantial increase in effectiveness over the F–4, the Navy's current first-line fighter. Eventually, the fighter force will consist of F–111B's, F–4's and F–8's. The F–8's are retained for the Essex-class carrier which cannot effectively operate the F–4's or F–111B's. The attack aircraft complement will consist of A–6's, A–4's and A–7's.

In the reconnaissance/ECM area, a new aircraft, the EA–6B will be introduced into the force. It will be far more capable than the EA–1F which it will replace. We will also continue the conversion of the A–5A's to the RA–5C configuration for use on the Forrestal-class carriers. The RF–8's will continue to be used on the Essex-class and Midway-class carriers.

ASW-Surveillance and Ocean Patrol Forces.

Last year I pointed out that the preliminary findings of a Navy study indicated that we were, generally, in better shape with regard to the submarine threat than we had previously thought, but that a continued high level of ASW research and development would be needed to hedge against the possibility of a more sophisticated threat in the future.

105mm Recoilless Rifle.



The XM 3 2.75" Rocket Launcher.

ASW Carriers (CVS). At the end of FY 1965, we had nine Essex-class CVS's, all but one of which had "angled" decks. The one "straight deck" carrier is less capable than the others and, because of the adequacy of our overall ASW capability, we have decided to phase it out of the force during the current fiscal year, with a reduction in annual operating costs of about $22 million. This will leave eight CVS's in the Fleet, four for the Atlantic and four for the Pacific, plus one training carrier in the Atlantic. . . .

The ASW carrier forces will continue to be equipped with both fixed-wing aircraft and helicopters. The older SH-34 helicopters have already been replaced with the new SH-3A/D. The older S-2's are being replaced by the S-2E's. As I noted last year, we are also providing a few A-4's for each CVS in order to give them a limited intercept and air defense capability. . . .

Attack Submarine Forces. By the end of the current fiscal year, the submarine force, excluding Polaris, will number 105 ships, 24 of which will be nuclear powered. While last year's program called for 31 nuclear-powered submarines to be in the force by this July, the Submarine Safety Program has resulted in some slippage. However, by end FY 1967 this slippage should be made up and we will be back on schedule.

Our continuing study of the ASW problem indicated that a total of about 64 first class SSN's will be needed. A total of 50 SSN's were funded through FY 1965, one of which, the Thresher, was lost. Two nuclear-powered submarines (one radar picket and one Regulus equipped SSN) were reassigned to the SSN role, making a total of 51 available. These two submarines and the two earliest SSN's are not deemed suitable for certain types of operations, leaving 47 available for missions requiring first class SSN's. Six SSN's were provided by the Congress in FY 1966, leaving a total of 11 SSN's to be funded in FY 1967 and subsequent years. We propose to start five SSN's in FY 1967 and the remainder in future years. This program will give us a total of 64 first class SSN's, plus four other SSN's which could be used together with the conventionally powered submarines for other missions. . . .

Sonar improvements will be made on almost all of the earlier SSN's to bring them up to the standard's of the latest SSN's. About $33 million has been included in the FY 1967 budget to start this program.

Destroyer Escorts. . . . Our currently planned construction program for destroyer escorts is the same as I described a year ago, and another 10 DE's have been included in the FY 1967 budget. Beginning with the ships funded in the FY 1964 program, all of the destroyer escorts now being built will be equipped with the new SQS-26 sonar, a highly effective system for submarine detection. Most of the earlier DE's and a large number of DD's, DDG's, and CG's (a total of 160 ships in all) will be equipped with the improved SQS-23 sonar. This improvement will significantly enhance their submarine detection and classification capabilities. About $14 million of available funds has been programmed for this purpose in FY 1966, and approximately $14 million more has been included in the FY 1967 budget request.

We also plan to continue our program to improve the ASW capabilities of 13 DD-931 class destroyers, all of which are less than ten years old. These ships will be provided with ASROC (including the Underwater Battery Fire Control System), improved communications equipment, a new variable depth sonar and improved ECM capabilities, plus certain minor structural modifications—at a cost of about $12 million each. With these improvements, the DD-931 class destroyers will be comparable to and, in some ways, even better in the ASW role than the DE's we are now building at a cost of about $29 million each. Five conversions were funded in FY 1966. Five more are included in the FY 1967 Budget. . . .

Small Patrol Ships. The program authorized through FY 1966 will provide a total of 33 small patrol craft by FY 1969. No further increases in these types of vessels are being proposed. However, as I indicated in my appearance before this committee in August, we have greatly increased the procurement of the smaller Swift craft, which are not included in the Small Patrol Ship category. These craft are designed for very close-in coastal search and surveillance. In addition, we are procuring a large number of river patrol craft (small water jet boats) financed by reprogramming about $9 million of available funds.

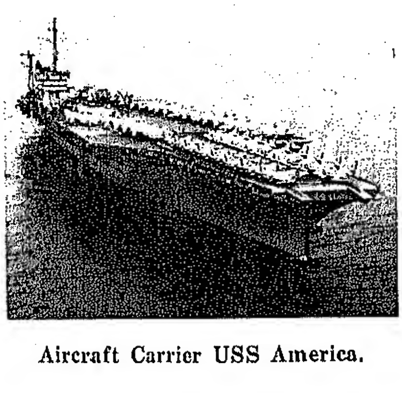
Patrol Aircraft. As I indicated last year, we plan to maintain a force of 30 squadrons of ASW patrol aircraft, three squadrons of seaplanes (SP-5's) and 27 squadrons of land-based aircraft (SP-2's and P-3's). Eventually, all of the SP-2's will be replaced by P-3's. Beginning with the FY 1968 buy, we plan that all new P-3 aircraft will be equipped with a new avionics system (A-NEW) at a cost of about $1 million per aircraft. . . .

Multi-Purpose Ships

We have grouped in this category those ships which possess capabilities for both anti-submarine warfare and Fleet air defense. There will be 265 such ships in the Fleet at the end of the current fiscal year, the bulk of them destroyer types. Many of these ships will have a guided missile capability.

Last year I described the four part program which we were undertaking to improve the air defense capabilities of the Fleet: (1) the Tartar-Terrier-Talos "Get Well" program, designed to correct deficiencies in missile ships already built or under construction; (2) the SAM (Surface-to-Air Missile) improvement program, designed to develop a new and more effective "Standardized" missile for use on both the Tartar and Terrier launchers and to provide for the incorporation of other improvements in these systems; (3) the Advanced Surface Missile System (ASMS), designed to provide Fleet air defense for the 1970's; and (4) the Guided Missile Ship Modernization/Conversion program, designed to improve the air defense capabilities of 22 existing guided missile ships.

Funding for the "Get Well" program has been substantially completed. Necessary hardware is being procured and installed The SAM improvement program is now well under



Aircraft Carrier USS America.

SH-3A Sea King Helicopters.

way. A substantial number of the "Standardized" missiles are being procured in FY 1966 (half medium and half extended range) for test, evaluation and documentation. . . .

. . . We, therefore, propose to start two new guided missile destroyers in FY 1967, at a total cost of about $145 million. . . .

In addition to these two new ships, we would also continue the Guided Missile Modernization / Conversion program which I described to you last year. Under this program, four cruisers and 18 frigates would be converted or modernized during the FY 1966-70 period, at a total cost of about $600 million. Three of these ships were funded in the 1966 program and six more (one cruiser and five frigates) are included in the FY 1967 budget. During the period of actual conversion/modernization, these ships are not considered operationally deployable, which accounts for the slight decline in guided missile ships in the FY 1968-70 period.

We are also studying the feasibility of providing a "close in" defense system for combat ships to augment their existing air defense capability. . . . Provision has been made in the FY 1967 budget of this Point Defense Surface Missile System. . . .

Amphibious Assault Ships.

Two years ago I presented a program designed to provide a modernized (20 knot) amphibious lift for 1½ Marine Corps Division/Wing teams by FY 1972 plus sufficient older ships to provide a slower lift for another half of a Division/Wing team. This program, as adjusted last year, involved the construction of a large number of new ships during the FY 1966-69 period. Our goal was to build toward a capability to land about one-third of the assault troops by helicopter, one-third by amphibian vehicles and one-third by either helicopter or landing craft, whatever the specific situation might dictate.

However, further study of this program has convinced us that some modification is desirable. The Navy is now investigating the possibility of designing a multi-purpose amphibious ship which could combine the features of several of the current specialized types. Accordingly, we have rescheduled the entire program, first, to provide time to develop a new ship design and, second, to accelerate the construction of the types most needed now. Under the program now proposed, 12 ships (11 LST's and one LSD) would be started in FY 1967 at a cost of $306 million.

As I noted last year, we are reactivating four "fire support" ships from the reserve fleet during FY 1966 —three Medium Landing Ships, Rocket (LSMR) and one Inshore Fire Support Ship (IFS). We are also retaining in the Fleet two heavy gun cruisers which had previously been scheduled for deactivation in FY 1967-68. We believe that these forces will be sufficient to provide the ship-to-shore fire support required under present conditions.

Mine Warfare Forces

. . . Five new minesweepers (MSO) will be started in FY 1967 at a cost of $43 million. These new ships will replace the older minesweepers (MSC) which will phase into our Naval Reserve Training Fleet to replace still older ships and expand that force.

We are now accelerating the helicopter minesweeping program which I mentioned last year and have begun procurement of the sweep equipment. We plan to provide this emergency minesweeping capability for a substantial number of Marine Corps vertical assault helicopters (CH-53A's). During FY 1967 we propose to reconfigure some of these helicopters to accept the sweep equipment. The equipment will be stowed aboard the helicopter assault carriers where it can be quickly installed in the aircraft as needed. This element of the minesweeping program will give us, at a modest cost, a significantly augmented minesweeping capability for certain types of operations. We also tentatively plan to procure additional helicopters with this emergency sweep capability for use aboard mine countermeasure support ships now planned for procurement in future years.

Logistical, Operational Support and Direct Support Ships

We presently plan on a force of about 168 logistical and operational support ships at the end of the current fiscal year, slightly more than scheduled a year ago. Because of increased requirements related to Southeast Asia, we have activated eight of these fleet support ships from the Reserve Fleet.

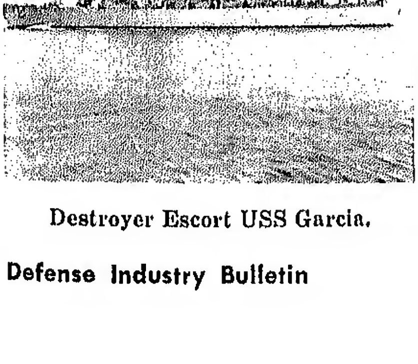
For the future, I believe that the number of these fleet support ships can be reduced as faster and larger ships are constructed and delivered. Last year we had tentatively scheduled the construction of 14 ships in FY 1967. However, with all icebreakers being transferred to Coast Guard jurisdiction, the one scheduled for construction in the FY 1967 program has been dropped. We also have deferred procurement of two auxiliary tugs (ATA's) and a fast combat support ship (AOE). A hydrofoil countermeasures ship (AGHS) has been deferred to permit completion of the testing of the experimental version. Construction of a small replenishment tanker has been also rescheduled to a future year. Accordingly, the FY 1967 program now includes eight fleet support ships: two ammunition, one combat stores, two replenishment fleet oilers, two salvage tugs and one fleet ocean tug.

Other Navy Aircraft

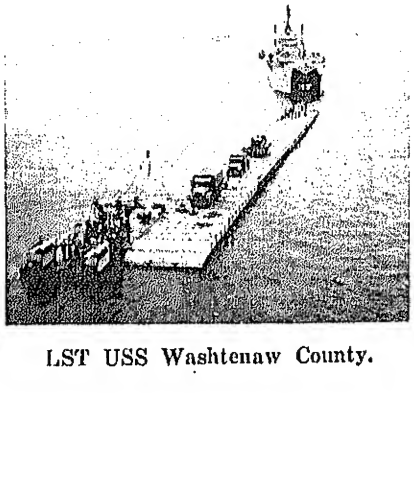
The Navy will gradually reduce the number of Fleet Tactical Support Aircraft during the FY 1967-71 period, as more capable aircraft enter the force. . . . We will continue our program for modernizing the "carrier-on board delivery" aircraft force, replacing older C-1's in the Fleet Tactical Support Squadrons with the more capable C-2's. Each of the 15 CVA's and eight CVS's will continue to have one C-1 directly assigned to it.

Marine Corps Forces

During the FY 1966-67 period Marine Corps active duty strength will be increased to about 278,000, compared with 190,000 at the end of FY 1965. As I noted earlier, one division and several supporting units have been added as part of the temporary Vietnam augmentation. And, as I pointed out earlier, the reserve division/aircraft wing team is being provided additional personnel to increase its readiness for quick deployment.



Destroyer Escort USS Garcia.



LST USS Washtenaw County.

At the end of the current fiscal year, the three active Marine aircraft wings will have about 1,200 combat and combat support aircraft. Over the next few years all of the older fighters will be replaced by F-4's armed with Sidewinder and Sparrow air-to-air missiles. The Marine Corps attack aircraft capability will continue to be improved with all weather A-6 aircraft replacing visual attack A-4's.

Although the number of reconnaissance and countermeasure aircraft will remain level, the overall capability will increase significantly as a new and much more effective countermeasure aircraft, the EA-6B, is introduced to replace the older and less effective EF-10B.

The tanker-transport forces are about the same as I presented last year. With respect to helicopters, some temporary transport squadrons will be added in FY 1967, and beginning in that year, the older CH-37's and UH-34's will be replaced with new CH-53's and CH-46's at a faster rate than contemplated last year in order to provide for combat attrition in Vietnam and free additional aircraft to equip the reserve aircraft wing. The number of light helicopter/observation aircraft will increase in FY 1967, reflecting the activation of two new squadrons and the introduction of the OV-10. . . .

Navy and Marine Corps Aircraft Procurement

To continue the modernization of the forces and provide for combat attrition in Vietnam, we now propose to increase the FY 1966 procurement program to a total of 1,129 aircraft and buy another 620 aircraft in FY 1967. . . . In effect, therefore, we have already started the procurement of these additional aircraft; and the funds required to complete this financing are included in the FY 1966 supplemental request, raising the total for this year to $2,231 million. The proposed FY 1967 aircraft procurement program would cost $900 million.

In the fighter category, we have substantially increased the proposed FY 1966 procurement program for F-4's over that planned a year ago. However, as I noted last year, we encountered a number of problems in the development of the Phoenix missile and the airborne missile control system for the F-111B. These problems have not as yet been fully resolved and some delay in the F-111B program appears inevitable.

In order to provide for attrition in Vietnam and continue the modernization of the Navy and Marine Corps attack forces, we now propose to buy significantly more attack-type aircraft in FY 1966 than planned last year and another large quantity in FY 1967. Included in the FY 1966 program are additional A-4E's, financed in the supplemental. Although the last procurement of these aircraft was made in FY 1964, the TA-4E, a trainer version of the A-4E (which I will discuss later), is still in production. We also propose to increase the FY 1966 procurement quantities of the A-6A and the A-7A.

Another large quantity of the latter is included in the FY 1967 budget. Also, the first procurement of 100 OV-10's (COIN-LARA) for the Marine Corps is scheduled in FY 1967. As noted earlier, we propose to initiate the development of a new electronic countermeasure aircraft, the EA-6B, and fund the first increment in FY 1966.

I pointed out last year that we had encountered difficulties in the development of the radar for the E-2A fleet early warning aircraft. Although these problems have been overcome to some extent, we do not now plan to buy any more of these aircraft, beyond those funded in FY 1966. Sufficient aircraft will be available to provide for each of the 12 attack carrier wings. The FY 1966 procurement of S-2E carrier search aircraft will be reduced slightly, reflecting the reduction of one CVS.

The helicopter program is essentially the same as I presented last year except that we have increased the number to be procured in FY 1966–67, partly to provide for attrition in Vietnam and partly to release more helicopters to the Marine Corps Reserve aircraft wing. We now plan to buy more CH-46A's and CH-53A's than previously planned. Our request includes sufficient funds to install the new Integrated Helicopter Avionics System (IHAS) on most of the CH-46's. . . .

To provide for increased pilot training in support of the Vietnam operation and free some more A-4's for the operating forces, we are increasing our FY 1966 procurement of the TA-4E. These additional TA-4E's will be assigned to the Combat Readiness Air Wings (CRAW's) and to the Marines.

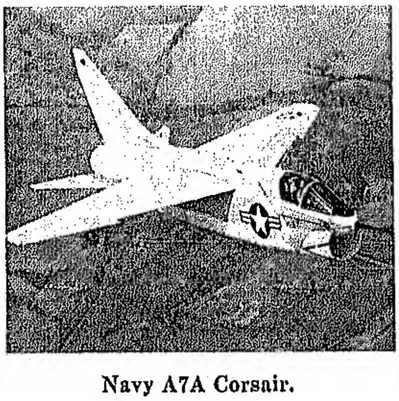
Other Navy Procurement.

The Navy's logistics objective for FY 1967 is essentially the same as last year, namely, to acquire sufficient stocks to support combat consumption for a sustained period, with an average of two-thirds of the force committed. More specifically, we propose to provide ship fills and combat consumption stocks for the active Fleet and the high-readiness reserve ships (Category Alpha). In addition, we propose to provide ship fills, plus combat consumption stocks for one-third of the other selected reserve (Category Bravo) ships. Anti-aircraft missile requirements are based on estimates of enemy aircraft that might have to be engaged.

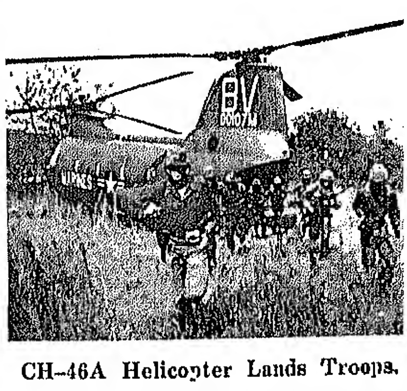
With respect to attack carrier and Marine Corps aviation, comparable logistic standards have been established. However, we have increased the planned attack sortie rates for which ordnance must be procured, by about 24 percent.

To achieve these materiel objectives and provide for combat consumption in Southeast Asia through FY 1967, we are requesting about $1,832 million for Navy missiles, ordnance, ammunition and other combat consumables; $474 million in the FY 1966 supplemental, and $1,358 million in the FY 1967 budget. With this supplemental, the amount provided for FY 1966 would total $1,192 million compared with $679 million for FY 1965.

The largest increases, compared with last year, are in air-to-ground ordnance, reflecting the consumption requirements in Southeast Asia and the expanded logistics objectives. For example, more Bullpup B missiles have been added to the FY 1966 program and the total number of MK-82 bombs to be procured has been increased significantly. Included in the FY 1967 program are large quantities of MK-81 and MK-82 bombs, as well



Navy A7A Corsair.



CH-46A Helicopter Lands Troops.

as the new Walleye television-guided glide bombs.

As I pointed out in previous years, one of our most pressing needs in the ASW area is more modern torpedoes. Last year we requested funds to buy a large quantity of the MK–46 lightweight ASW torpedo. This torpedo is much more effective against high speed, deep diving, nuclear-powered submarines than the MK–44 which it is replacing; and it can be launched by surface ships (tubes and ASROC) and by aircraft (helicopters and fixed-wing). For FY 1967, we propose to buy another large quantity of these torpedoes.

The first increment of MK–48 torpedoes for operational evaluation was funded in FY 1966. . . . We will begin procurement toward our inventory objective in FY 1967.

Funds are also included in the FY 1967 budget for Julie and Jezebel sonobuoys as well as more 3-inch and 5-inch shells and 5-inch rockets to replace consumption in Southeast Asia and to continue the buildup of our stocks of these rounds.

Marine Corps Procurement.

Our logistics objective for the Marine Corps ground forces is to provide sufficient materiel to equip five divisions and sustain a force of four divisions in combat for a sustained period with five-sixths of the force committed. For the Marine Corps aircraft wings, we are providing equipment for four wings (one reserve) and sufficient materiel to support four wings in combat for a sustained period with two-thirds of the force committed.

A total of $791 million is now estimated for Marine Corps procurement in FY 1966, of which $517 million is included in the supplemental request. For FY 1967, $228 million is requested. A large portion ($338 million) of the additional funds requested for FY 1966 is for procurement of ammunition and ordnance equipment. In FY 1967, we propose to procure about $130 million of such materiel.

For the procurement of support vehicles the FY 1966 supplemental includes about $60 million and another $41 million is included in the FY 1967 budget. A large portion of the FY 1966 supplemental amount is for the procurement of vehicles for the new Marine Division.

In the electronics category, the Marine Corps will buy, in FY 1967, a variety of radar, radio and other communications and electronic gear, at a cost of $72 million, including equipment for the Marine Tactical Data System, the Field Surveillance Radar AN/PPS–6 (a single-man pack radar which replaces a five-man pack radar), Multi-Channel Terminal Equipment which adds additional capacity to existing radios, etc. An additional $43 million has been included in the FY 1966 supplemental budget for electronic gear.

Air Force General Purpose Forces

During the past year, we have continued our program of studies to determine the proper size and composition of the tactical aircraft forces. The results of these studies, combined with the impact of the conflict in Southeast Asia, are the source of several recommendations for change in the Air Force General Purpose Forces at this time.

Tactical Fighters.

We are still programming a tactical fighter force of 24 wings essentially the same size force planned a year ago. However, there are a number of changes within the force structure and procurement programs that we now believe should be made. For the short run, we want to: (1) replace in the active forces the aircraft lost as a result of combat in Southeast Asia and the higher tempo of operations generally; (2) provide for possible future attrition which we must now, in prudence, anticipate; (3) provide for the necessary expansion of the training base; and (4) take advantage of opportunities to improve the operational effectiveness of the present force. For the longer run, we want to obtain a better balance within the overall fighter force between multi-purpose aircraft which, though capable of both air-to-air and air-to-ground operations, are necessarily expensive, and more specialized aircraft which, though designed primarily for air-to-ground operations, can be procured and operated in larger numbers for the same cost. The net result of this more efficient mix of the two classes of aircraft will be an increase in our overall tactical air capabilities.

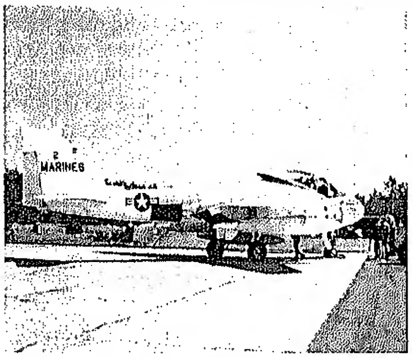
Accordingly, we now propose to procure the A–7 as an attack aircraft for the Air Force. . . .

A year ago we proposed an FY 1966 procurement of a sizeable number of F–4 aircraft and tentatively planned on completing the program in FY 1967. Now, to replace Southeast Asia attrition, to provide for the expanded readiness training and rotation base, and to increase the size of the force, we propose to increase the FY 1966 quantity very substantially and continue F–4 procurement in FY 1967.

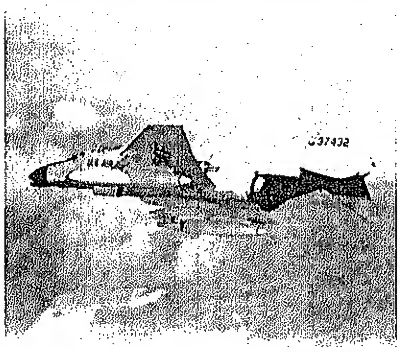
The F–111A procurement schedule has been changed slightly from that forecasted a year ago in order to accommodate changes in the F–111B program and the decision to procure a bomber version of the aircraft. For FY 1967, we now propose to procure a few more than planned a year ago. The number scheduled for procurement in the subsequent years has been adjusted to the new force goal (reflecting the proposed procurement of a force of 210 dual purpose FB–111A's) as well as the expanded readiness training and rotation base.

Tactical Reconnaissance Forces.

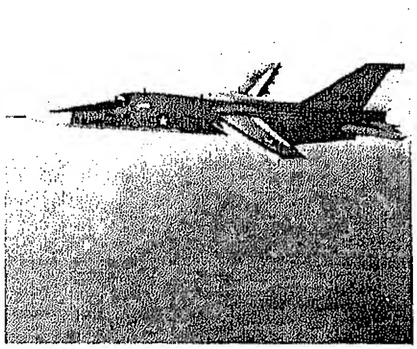
The size of the tactical reconnaissance force presently scheduled for the FY 1967–71 period is essentially the same as recommended a year ago. However, anticipated attrition in Vietnam, together with increased training requirements, is expected to reduce the number of RF–101's available for the operating forces. This shortfall will be made up, initially, by retaining more of the RB–66's and, eventually, by additional RF–4's from new production. Another increment of RF–4's have been included in the



U.S. Marine Corp A6A Jet Aircraft.



U.S. Air Force RF–4C Aircraft.



U.S. Air Force F–111A.

FY 1967 program and more are planned for the future. . . .

As a possible future replacement for the presently planned reconnaissance aircraft, we now propose to develop a reconnaissance version of the F-111. This development will be designed to minimize the number of changes in the aircraft's present configuration and is estimated to cost $50 million, of which $12.5 million is to be programmed from available funds in FY 1966 and $12.5 is requested in the FY 1967 budget. No production decision on this aircraft is required at this time.

Tactical Air Control System (TACS).

The Tactical Air Control System provides the command and control capability for the tactical air commander in field operations. . . . We now propose to procure an initial quantity of the more capable OV-10 (formerly the COIN/LARA) aircraft in FY 1966, and a large quantity in FY 1967 to replace the older O-1's.

Special Air Warfare Forces (SAWF).

During the last year we have added to the Special Air Warefare Forces a number of aircraft including U-10's and C-47's for psychological warfare missions (leaflet dropping, etc.), and AC-47 direct fire support aircraft for operations in Vietnam. We now plan to add still more aircraft to the operational forces as well as expand the combat crew training capability.

Advanced Flying Training.

As previously discussed, we are undertaking a substantial expansion of the advanced flying training base for the active forces, to be accomplished initially by using aircraft previously scheduled for transfer to the Air National Guard and, later, by increased deliveries from new procurement. The total number of aircraft assigned to this role will be raised from about 280 at end FY 1965 to about 500 in the FY 1967-71 period.

In summary, the Air Force will procure a total of 780 tactical, air control and reconnaissance aircraft for the General Purpose Forces in FY 1966, at a total cost of $2,175 million. (Of this total, 479 aircraft costing $767 million are included in the FY 1966 supplemental request.) For FY 1967, 485 aircraft costing $1,572 million are requested for these forces.

Other Air Force Procurement.

For the past several years our logistic objective for the Air Force General Purpose Forces has been to have sufficient stocks to support a sustained period of combat consumption with an optimum balance of supplies for all forces engaged.

The Air Force's aircraft non-nuclear ordnance program for FY 1966 totals $1,359 million, of which $738 million is included in the supplemental request. The proposed FY 1967 program totals $1,780 million. Except in those few cases where existing production capacity makes it impossible, this combined FY 1966-67 funding will fully meet the revised inventory objectives as well as provide for all projected combat consumption in Southeast Asia.

Among the principal items in our program for these two years are large quantities of "iron bombs" used by our forces (especially B-52's) in Southeast Asia. (In total, $824 million has been included in the FY 1966-67 budgets for these types of bombs.) Large sums are also provided for napalm bombs, 2.75-inch rockets, 20mm ammunition, Bullpup missiles for the CBU and other cannister bombs. We also propose to procure for the Air Force substantial quantities of sophisticated special purpose weapons—Walleye, Rockeye, Sadeye, and the Shrike anti-radar missile.

Theater Airbase Vulnerability.

For some time we have been concerned about the vulnerability of our overseas tactical airbases and of the aircraft on them to non-nuclear attack. During the past year, a special Air Force team has made an extensive analysis of the entire problem of airbase vulnerability — how bad it is, what can be done about it, and what the benefit of vulnerability-reducing measures would be. . . .

We have included about $26 million in the FY 1967 budget to get this program under way. While its total cost is still to be worked out, I can assure you that it will be but a fraction of the value of the aircraft alone which would be otherwise lost in an attack on our air bases. Few, if any, other areas in our tactical air program offer so great a potential return on the investment. For the past three years, the Congress has denied our budget requests for tactical aircraft shelters. In view of the seriousness of the vulnerability problem I must once again urge your favorable consideration of this program in our FY 1967 budget request.

Tactical Exercises.

In peacetime, tactical exercises help the General Purpose Forces to maintain a high state of combat readiness, provide opportunities to practice close coordination among the Services and with allied forces, and furnish a realistic testing environment for new concepts and weapon systems. However, beginning in FY 1965, the pace of larger scale exercises directed and coordinated by the Joint Chiefs of Staff has slowed down with our increasing involvement in Southeast Asia. Many of the purposes of these exercises are, of course, regularly accomplished in the course of preparing, deploying and actually engaging our forces in Vietnam. For that reason, the cost of such exercises in FY 1965 totaled $42 million compared with $110 million estimated a year ago; and the current year's program is estimated at only $28 million compared with $131 million included in our original request. On the assumption that the situation in Vietnam will continue to require substantial U.S. military participation, the tentative FY 1967 program has been set at $60 million. The actual conduct of the program will be decided as events unfold.

In addition to these larger JCS directed and coordinated exercises, the Services will continue to conduct training and readiness exercises, including a number with elements of allied military establishments.

Financial Summary

The General Purpose Forces Program, which I have outlined above, will require total obligational authority of $30.0 billion in FY 1966, of which $8.8 billion is included in the supplemental request, and $25.7 billion for FY 1967. A comparison with prior years is shown below:

($ Billions Fiscal Year)

	1962 Original	1962 Final	1963 Actual	1964 Actual	1965 Actual	1966 Est.	1967 Prop'd
Total Obligational Authority	$14.5	$17.5	$17.5	$17.7	$19.0	$30.0	$25.7

Airlift and Sealift Forces

Included in this program are the Military Airlift Command transports, the Air Force's Tactical Air Command troop carrier aircraft, the transport and troop carrier aircraft in the Air Force's reserve components, and the troop ships, cargo ships, tankers and "forward mobile depot" ships operated by the Military Sea Transport Service.

I believe it is apparent from my discussion of the limited war problem and our General Purpose Force requirements that an adequate airlift/sealift capability is essential to our global strategy in the collective defense of the Free World. As I have pointed out in previous years, there are at least four ways in which a quick-reaction capability can be achieved:

- Military forces can be deployed, in advance, to potential trouble areas.
- Equipment and supplies can be prepositioned in those areas and military personnel airlifted in as required.
- Equipment and supplies can be stored aboard ships deployed near potential trouble spots, again with the men airlifted in as needed.
- Both men and equipment can be held in a central reserve in the United States and deployed by airlift and sealift as required.

Each of these methods has its own advantages and disadvantages. For example, while the prepositioning of our forces overseas probably provides the fastest response capability and reduces the need for airlift and sealift, it also introduces a greater degree of rigidity into our military posture by committing forces in advance. Moreover, this approach increases our overall requirement for men, materiel and foreign bases and involves the operational uncertainties and diplomatic difficulties which often arise from such semi-permanent overseas deployment; it also increases defense expenditures abroad.

In contrast, a central reserve of mobile General Purpose Forces in the United States, ready for immediate deployment provides considerably more operational flexibility and does not require as big an overseas military establishment as does a strategy which relies on such geographically dispersed forces. However, timely deployment from a central reserve requires very large strategic airlift and sealift forces readily available at all times.

The prepositioning of equipment and supplies overseas either in land-based or sea-based depots is something of a compromise between the two extremes. This approach to the problem of quick response, while economizing on manpower, requires larger stocks of supplies, and some manpower, since such stocks must be maintained at each overseas prepositioning site. And, of course, we must also have the airlift needed to move the men to where they can be joined with the materiel. However, our capacity to move men is far greater than our capacity to move equipment and supplies, and for this reason, prepositioning has proven very attractive in certain situations during the past few years, especially in the case of very heavy and very bulky equipment.

Prepositioning on land, although necessary in many instances, involves in addition many of the same problems encountered in deploying large forces in foreign countries. Restrictions imposed by the host country could, in some cases, affect the availability of the stocks and thereby limit our own freedom of action. Moreover, maintaining the materiel overseas in a ready-to-use condition can be quite costly, and almost always involves substantial foreign exchange outlays. Also, in places such as Southeast Asia, the costs of maintaining certain types of equipment which are especially susceptible to deterioration in hot and humid climates can be quite high.

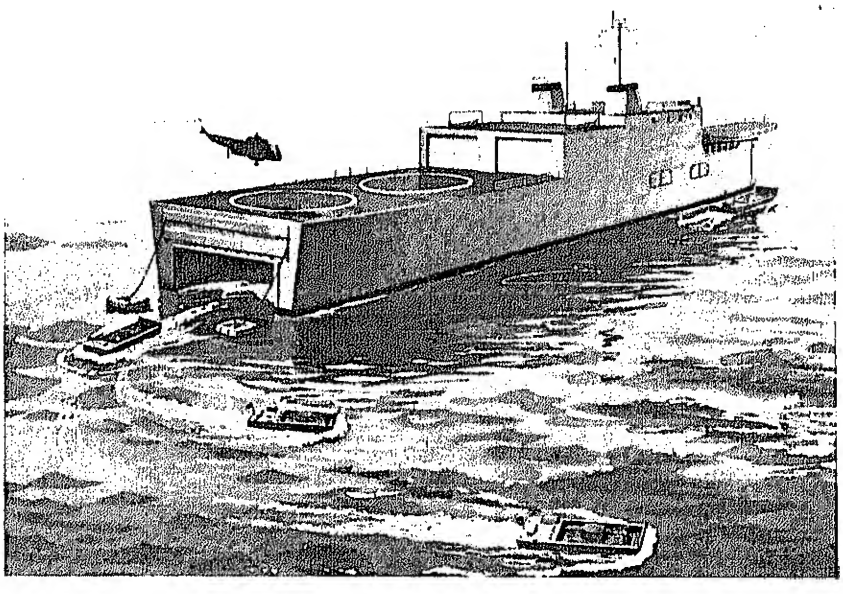
It was these factors, in particular, which led us to view with favor the so-called "floating depot" concept which we have developed and expanded over the last few years. By loading the equipment and supplies aboard ships in which the temperature and humidity can be controlled and by stationing these ships in Far East waters, we are able to move the materiel to any part of that area in a matter of just a few days. And the troops can be moved by air well within the time these ships require to get to their destinations. . . .

From that time on we have each year consistently raised our goals both with regard to the airlift and the sealift. We are now proposing an expanded airlift program which will provide by FY 1973 an equivalent 30-day lift capability from West Coast airfields to Southeast Asia more than ten times greater than that available in FY 1961, and nearly double the goal I talked about last year. This increase is to be achieved through two major changes in the program.

First, we are now proposing a large increase in the C–5A program.

Second, as I informed the Committee last August when I appeared in support of the amendment to the FY 1966 budget, we have substantially increased the planned utilization rates of airlift aircraft by raising the manning levels of selected units, both active and reserve. . . .

With respect to the intra-theater and assault airlift capability, generally, we will have by end FY 1967 30 squadrons of C–130's (472 U.E. aircraft), over half of which will be the longer range C–130E's. . . .



Fast Deployment Logistic Ship (FDL).

By end FY 1968 we will have many hundreds of C–130's and C–141's in the active forces. . . .

In addition, the Air Force will shortly begin a program to modify the C–123 aircraft, now assigned to the Special Air Warfare Forces, with jet engines and anti-skid brakes. . . .

The C–124 provides a limited but valuable tactical airlift capability. . . .

Later, as the new C–5A's are delivered to the active forces, a large number of C–130's will be transferred to the reserve forces to replace the C–124's.

Over and above these programs, we are re-examining the entire problem of "retail" airlift within the theater. It is clear that an efficient mix of tactical airlift aircraft must be available to assure that our deployed forces can be promptly committed to combat once they deploy to the theater of operations. Exactly what this mix of aircraft should be, however, is still not clear. Therefore, the Services are undertaking a comprehensive study of our tactical airlift requirements for the longer term.

With regard to sealift, we are continuing to concentrate our attention on the special purpose ships, increasing the number of Victory class forward mobile depot ships and adding more Fast Deployment Logistic (FDL) ships to the program.

The ultimate number of FDL ships to be constructed is yet to be determined. However, it is clear from our experience over the last six months that in a limited war it may be desirable to supplement the U.S. Merchant Marine with DOD special purpose shipping.

In a general war there is no question that we can commandeer for military purposes all of U.S. Flag shipping, if required. But, in a limited war the situation is never as clear cut, particularly in the kind of military operation we are now supporting in Southeast Asia. Yet this is precisely the kind of situation we are most likely to confront in the years ahead.

Even last year I pointed out to the Committee that, while we depend very heavily on the Merchant Marine for our sealift, it takes time to assemble the ships and load them. Therefore, if we want a capability to deploy large forces rapidly to distant areas, we need both additional airlift and immediately available fast sealift. Our immediate problem of sealift in support of our effort in Southeast Asia is being solved by reactivating additional National Defense Reserve Fleet ships and by using whatever other shipping is available, with first priority for U.S. Flag vessels. Already we have reactivated 58 ships from the Reserve Fleet, and more will be reactivated over the next few months. These ships, together with the MSTS nucleus fleet and other available private shipping, should be sufficient to meet all of our requirements as we see them now. If these requirements should increase, we still have a relatively large number of suitable ships in the Reserve Fleet which could be reactivated. And, of course, there are some ships in the U.S. Merchant Marine we haven't used and some 4,500 ships of other friendly nations we haven't called upon.

Airlift

. . . Funds for the procurement of the first eight C–5A aircraft are included in the FY 1967 Budget. The first large procurement will be made in FY 1968. . . .

The C–141 program which we presented here a year ago envisioned an ultimate 13 squadron force (208 U.E. aircraft), a FY 1966 procurement of 84 aircraft and a final FY 1967 buy of 31. . . .

Sealift

As previously mentioned, we plan to proceed with the construction of a fleet of Fast Deployment Logistic ships. Last year we requested funds for four of these ships and tentatively scheduled the procurement of more in subsequent years. Although Congress funded only two of these ships in the FY 1966 budget, all of our analyses during the past year confirm their value to the sealift force. Therefore, we have tentatively scheduled the construction of additional ships in the FY 1968–71 period. However, propose to build these ships un much the same kind of "total pa age" contracting procedure used the C–5A. Our schedule calls for contract definition competition in m FY 1967 with contractor selecti and award of the two FY 1966 sh coming in the spring of 1967. Cons ering the length of time necessary make this selection and get prod tion facilities and procedures orga ized, we have decided to defer furt procurement of these ships until 1968. However, $10 million in resea and development funds will be need to initiate contract definition a these funds are included in the 1966 supplemental. . . .

The three Victory-class cargo shi which were converted to forwa mobile depots in FY 1963 are pr ently deployed around Subic Bay the Philippines. Last year we ten tively planned on converting more these Victory ships with the ent force to be operational by end 1967. We now plan to increase th force by about ten percent. The ships will be phased out when t new fast deployment logistic shi become available for this role. . . .

One shallow draft tanker, especial suited for operations in Southea Asia, has been activated this ye raising the total tanker force to We propose to keep the tanker for at this level over the next few yea The program which we began in F 1965 of rehabilitating and lengtheni the MSTS tankers built during Wor War II will be continued. Funds f modernizing four of these ships we provided in the FY 1965–66 budg and additional funds are requested f two more in FY 1967. We are al studying the desirability of replaci some of these older tankers with ne ships. . . .

Financial Summary

The Airlift and Sealift Forces have outlined will require Total Obl gational Authority of $2.2 billion FY 1966, of which $0.5 billion included in the supplemental reques and $2.1 billion in FY 1967. A co parison with prior years is show below:

($ Billions, Fiscal Years)

	1962 Orig.	1962 Final	1963 Actual	1964 Actual	1965 Actual	1966 Est.	1967 Proposed
Total Obligational Authority	.9	1.2	1.3	1.2	1.5	2.2	2.1

Research and Development

Included in this major program are all the research and development efforts not directly identified with weapons or weapon systems approved for deployment.

We have made a special effort this year not only to cull out any marginal projects in the FY 1966 and 1967 research and development programs, but also to defer to future years all projects whose postponement would not have a seriously adverse effect on our future military capabilities. But even while we have eliminated, reduced and deferred projects in some areas of this program, we have had to add, increase and accelerate projects in other areas to meet newly recognized urgent requirements. . . .

Before I turn to the specifics of the FY 1967 Research and Development program, there are two general areas which might usefully be discussed as entities rather than in terms of the separate projects which they comprise. These are nuclear testing and test detection, and the space development projects.

Nuclear Testing and Test Detection

. . . The Defense Department, in cooperation with the Atomic Energy Commission (AEC), is committed to four specific safeguards with relation to the Test Ban Treaty. For the Defense Department's portion of this program, we have budgeted a total of $239 million for FY 1967, compared with $241 million in FY 1966 and about $250 million in FY 1965.

In support of the first safeguard—the underground test program—we have included $28.5 million in the FY 1967 budget, compared to $30.6 million in FY 1966. . . .

In support of the second safeguard—maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology—our FY 1967 budget includes $53 million. . . .

About $35 million has been included in the FY 1967 budget in support of the third safeguard—the maintenance of a stand-by atmospheric test capability. . . .

In support of the fourth safeguard—the monitoring of Sino-Soviet nuclear activities—we have included a total of $122.2 million in the FY 1967 budget, compared with $113.5 million in FY 1966 and $111.9 million in FY 1965. We conduct two principal programs to support this safeguard—the Advanced Research Projects Agency's Vela program and the Atomic Energy Detection System (AEDS).

The Vela program is directed to the development and demonstration of an advanced surveillance system for detecting, locating and identifying nuclear tests underground, underwater, in the atmosphere and at high altitudes in space. . . . Approximately $8 million has been included in the FY 1967 program for the space portion of the Vela program.

The Vela underground test detection program is also progressing very well and another $32 million has been included in the FY 1967 program for the space portion of the Vela program.

The Vela underground test detection program is also progressing very well and another $32 million has been included in the FY 1967 budget to continue this work. The construction of a Large Aperture Seismic Array (LASA) was completed last year in eastern Montana. . . . We have also included $10 million in the FY 1967 budget for preliminary work on other LASA arrays, but these funds will not be committed until the effectiveness of the Montana LASA system is fully evaluated. . . .

Space Development Projects

While the various elements of the Defense Department's space effort are spread, on a functional basis, throughout the program and budget structures, I believe this effort can be more meaningfully discussed as a separate entity.

Again, I want to remind you that the Defense space program is an integral part of the much larger National Space Program, expenditures for which now total over $7 billion a year. The Defense portion of this national program is designed (1) to explore the space environment for military purposes, (2) to complement the work of NASA and other Government agencies in those fields in which the Defense Department has already achieved a high degree of technical competence and (3) to explore the usefulness of manned space systems for military purposes. . . .

Accordingly, from the outset, I have laid down two fundamental criteria which the Defense space effort must meet. First, it must mesh with the efforts of NASA in all vital areas, i.e., the Defense and NASA programs taken together must constitute a single, integrated national program. Second, projects supported by the Defense Department must hold the distinct promise of enhancing our military power and effectiveness. . . .

In total, about $1,621 million of our FY 1967 budget request is for the space program, slightly less than in FY 1966.

Spacecraft Mission Projects.

The largest space mission project in terms of total program cost is the Manned Orbital Laboratory (MOL). Last year I described four courses of action which we planned to take preliminary to a final decision on proceeding with this program. Briefly they were as follows:

- The Air Force was to define an experimental program to meet the broadened military objectives of MOL, placing emphasis on developments which might lead to operational systems. The Air Force was also to determine the essential vehicle characteristics required to meet those objectives and, in cooperation with NASA, was to define any additional significant experiments of a general scientific and technological nature which should be carried out.
- The Air Force was to assess the proposed specifications of a MOL system, i.e., the Gemini B vehicle, the laboratory section and the Titan IIIC booster, against the needs of the experimental program. Three preliminary design studies were to be initiated with industry to provide the cost and technical information needed to select the final configuration. The Air Force was also to examine various configurations of the Apollo system that were being studied by NASA to meet its own objectives.
- To preserve the option of proceeding with MOL on an orderly basis and to make effective use of the Titan III R&D flight program, action was to be taken to qualify components of the Gemini B plus laboratory configuration aboard Titan IIIC approved development vehicles. (No men were to be carried on these flights.)
- One hundred and fifty million dollars was to be included in the FY 1966 budget for continuing design studies, narrowing the effort to two contractors for program definition and to a single contractor for subsequent full-scale development. The study contractors were to be selected on the basis of their ability to execute development, whether the approach finally selected was the Gemini B or a version of the Apollo system. No FY 1966 funds were to be obligated until we were convinced that a satisfactory approach had been found, and that the expected results of the program would be commensurate with the cost.

The actions (including the provision of $150 million in FY 1966) were

carried forward during the spring and summer of last year and after a thorough discussion of the MOL project with the Space Council, the President on August 25th decided to proceed with its development at an estimated cost of about $1.5 billion.

NASA will study the MOL to determine the feasibility of using it for experiments of a general scientific and technological nature. The Air Force will attempt to accommodate these experiments wherever possible as long as they do not seriously interfere with the military objectives. As in the past, NASA and DOD will continue to work closely to ensure that the manned space flight effort of both agencies is fully coordinated and that the program is integrated with the national effort. . . .

We intend that the MOL development program should proceed on a deliberate and orderly schedule, using the $150 million provided for FY 1966 and the $159 million requested for FY 1967. Design definition, system integration, development of specifications and determination of firm cost proposals are scheduled for completion during this coming spring and summer, after which contracts will be awarded for the full-scale development of hardware.

The next item, Gemini (Manned Space Flight), represents the Defense Department's participation in the NASA-Gemini program. The $2 million provided for FY 1966 will complete the remaining military experiments planned through the end of this calendar year. . . .

A total of $62 million is requested in FY 1967 to continue work on Defense satellite communications development programs, which I described to you some detail last year. . . .

Vehicle, Engine and Component Developments.

The largest project in this category is still the Titan III development, for which about $66 million is requested in FY 1967. . . .

The current principal effort under the START (Space Technology and Advanced Re-entry Tests) program is project Prime, for which we included $16 million in the FY 1967 budget. . . .

The $2 million requested for Advanced Space Guidance is to support four major tasks: definition of guidance and control requirements for advanced manned orbiting systems and re-entry spacecraft and conceptual development of techniques and components to support these requirements; investigation of horizon sensing techniques and sensors to establish capabilities for precision space navigation; investigation of star tracking techniques and sensors to determine space capabilities and limitations; study of known and unknown landmark tracking for autonomous space navigation.

The $2 million included in the FY 1967 budget for Solid Rocket Engine Development is for the continuation of studies in large solid motors for future ballistic missile and space launch vehicles. . . .

Two years ago we initiated a new liquid rocket engine program, designed to demonstrate the feasibility of the modular approach to large rocket engine development. . . . A sum of $15 million is required for this program in FY 1967.

Other Defense Activities Supporting the Space Program.

The Ground Support category includes the prorated cost of the missile ranges and test instrumentation as well as the satellite detection and tracking systems. The largest item in this category is the $134 million for the Eastern Test Range.

The next largest item is the ground based system for satellite detection, tracking and control — Spacetrack (USAF) and SPASUR (Navy). . . . The FY 1967 budget includes $33 million for Spacetrack and $6 million for SPASUR.

The $59 million requested for Satellite Control Facilities will continue the modernization and improvement of the existing network of six permanent tracking stations and one control center and provide for the construction of a new permanent tracking station on Guam to replace the temporary mobile unit now being used there. . . .

Research

. . . for FY 1967, we are asking a total of $417 million. This is about $27 million more than the $390 million available for FY 1966 with most of the increase ($18 million) devoted to the new "University Program". As I informed the Committee last year, the Executive Branch under the leadership of the President's Office of Science and Technology has undertaken a program to develop centers of technical excellence in all parts of the country, for both civilian and military purposes. The concentration of the Government's research effort in a relatively small number of the larger universities has been a matter of concern for many years. The new University Program will seek to broaden the research base by helping other institutions participate in the effort. With regard to the Defense portion of this program, we plan to take the initiative and systematically visit those universities which have not as yet had the opportunity to bid for Defense research work. In the course of these visits, we hope to help these institutions determine their capabilities and inform them on how to prepare proposals. This new effort should help broaden the research base and enable the Government to tap the full potential of the Nation's existing capabilities in this area.

Defense research in the Engineering Sciences, for which we are requesting a total of $119 million in FY 1967, is directed primarily toward the solution of problems anticipated in the development of hardware for future operational systems.

• Electronics research ($28 million) is concerned with the discovery of new concepts and techniques for the development of electronic devices. . . .

• Materials research ($47 million) is directed toward the development of new compounds, composite structures, plastics and alloys. . . .

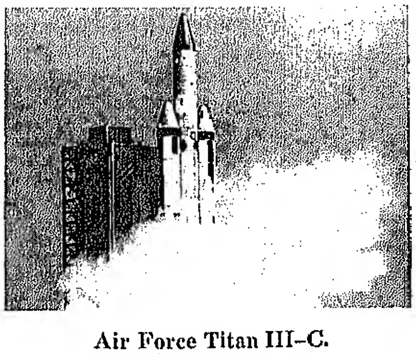
• Mechanics research ($29 million) investigates the behavior of structures and machines under static and dynamic loads. . . .

• Energy conversion ($15 million) studies try to improve thermoelectric and solar energy devices. . . .

Research in the Physical Sciences, for which we are requesting $95 million for FY 1967, advances our understanding of natural phenomena. Such progress is fundamental to all other research.

• General physics ($30 million) concentrates on the classical fields of optics, thermodynamics, and statistical mechanics. . . .

USAF Manned Orbiting Laboratory.


Air Force Titan III–C.

• Nuclear physics ($16 million) is concerned with both nuclear structure and cosmic ray propagation. . . .

• Defense research in chemistry ($11 million) is devoted particularly to the synthesis of new compounds and materials. . . .

• Mathematics research ($38 million) develops new methods of calculating and representing natural phenomena. . . .

Environmental Sciences, for which we are requesting about $57 million, investigate the earth, air and sea around us and are increasingly important as man extends his domain into space and under the sea.

• Terrestrial sciences ($6 million) support basic research in seismology, geodesy and soil mechanics. . . .

• Atmospheric research ($21 million) investigates the air nearest the earth. . . .

• Astronomy and Astrophysics ($10 million) are concerned with natural phenomena beyond the earth's atmosphere. . . .

• Oceanography ($20 million) explores the nature of the sea and maps the ocean floor, the knowledge of which is vital to our undersea warfare effort. . . .

Research in Biological and Medical Sciences, for which we are requesting $34 million, is directed primarily toward reducing the impact of military casualties and to the provision of the best possible medical care for military personnel in the field. . . .

Behavioral and Social Sciences, for which we are requesting $13 million, concern the psychological and physical factors which influence human performance. . . .

The Nuclear Weapons Effects Research program is managed by the Defense Atomic Support Agency (DASA) under the general direction of the Joint Chiefs of Staff and the Office of the Secretary of Defense. The program includes applied research in the fields of air blast, nuclear and thermal radiation and biomedical, electromagnetic and other military significant effects. . . .

Special High Frequency Radio.

Exploratory Development

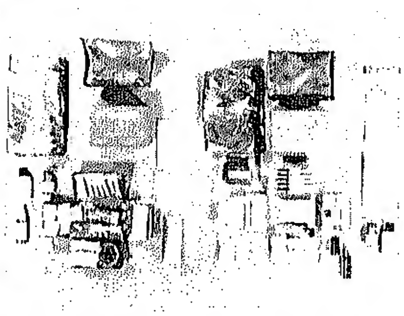
This is the effort directed toward the expansion of technological knowledge and the development of materials, components, devices and systems which it is hoped will have some useful application to new military weapons and equipment. Here the emphasis is on exploring the feasibility of various approaches to the solution of specific military problems, up to the point of demonstrating feasibility with a "bread board" device and prototype components and subsystems. Along with Research, Exploratory Development forms the pool of technical knowledge from which future systems will be devised and designed. . . .

We are requesting a total of $1,063 million for Exploratory Development in FY 1967, $97 million less than the amount provided in FY 1964. . . .

Army.

The Army's Exploratory Development effort is directed to devising new means to provide the front line soldier with effective close support and to protect him against all possible forms of enemy attack. A large part of the $232 million requested for FY 1967 will be devoted to techniques or equipment directly applicable to front line combat with emphasis on communications and electronics, ordnance and medicine. More specifically, this work includes: electronic counter-countermeasures; radios, antennas and survival kits specially adapted to operations in tropical jungles; light intensifiers for night vision devices; experimental radars; technology to increase the capability of combat surveillance; investigations of new concepts of boats for assault operations and for the emplacement of bridges; new vaccines, techniques to treat burns and prosthetic devices.

Somewhat less than one fifth of the Army's Exploratory Development effort is divided between aeronautics and materials. . . .



An Individual Aid and Survival Kit.

The balance of the Army's program is devoted to such projects as the development of new support and logistics techniques, automated systems for compiling maps, and improved techniques for construction on ice caps. The Army will also continue to carry out laboratory projects in nuclear effects in support of one of the safeguards to the limited Nuclear Test Ban Treaty.

Navy.

The principal Exploratory Development effort of the Navy Sea Warfare Systems is directed toward achieving better performance in naval weapons and equipment. About 40 percent of the $304 million requested for FY 1967 will be devoted to this category. Approximately $80 million of that amount is for the refinement of surveillance and navigation devices. Nearly $44 million is for the development of new design concepts for naval vessels, such as the Albacore type of submarine hull; captured air bubble ships; bow sonar domes, hydrofoil craft and new hulls to penetrate ice more easily. The remainder of the Sea Warfare Systems effort is directed toward better countermeasures and logistics. The decrease in funds allocated to this category in FY 1967 does not reflect a de-emphasis of Sea Warfare Systems but rather the maturing of some major efforts to the Advanced Development stage.

With respect to communications, electronics and ordnance, the Navy is especially interested in anti-radiation missiles which can home on enemy electronic emissions and in the development of missiles able to discriminate between enemy small craft and the background radar clutter created by waves. The Navy's work on aeronautics is concerned with the special problems of developing aircraft suitable for carrier operations. . . .

Air Force.

About half of the $316 million requested for the Air Force's Exploratory Development program in FY 1967 will be devoted to space investigations and related projects. This emphasis flows naturally from the fact that, whereas the problems of operating in the atmosphere are relatively well understood, we are, at this time, really "exploring" space. Currently, the major effort is directed toward achieving better systems for controlling missiles in flight. Particularly, we are working on inertial guidance, spaceborne computer techniques, navigation sensors, methods of identifying targets for missiles and terminal guidance. We are trying

to develop means to make telemetric transmissions more secure and to improve the pumps, nozzles and combustion chambers of the rocket motors. In the area of bioastronautics, we are concerned with designing devices to sustain life in space and to counteract the lethal radiations and extremes of heat and pressure found in that environment.

About one sixth of the total Air Force's Exploratory Development program will be devoted to the improvement of surveillance techniques. Particular attention will be paid to perfecting our photographic, infrared and electronic over-the-horizon capabilities.

Finally, the Air Force will continue work on such areas as improving the arming and fuzing of conventional ordnance, better lightweight, high strength alloys, and investigating gravitational and geodetic problems.

For Air Force Exploratory Development Laboratory Support, $97 million is requested for FY 1967. . . .

Advanced Research Projects Agency (ARPA).

ARPA operates as a small research and development management team, supervising its Service-conducted programs by overall financial control and technical direction. A total of $211 million is included in the FY 1967 program for ARPA's projects in Exploratory Development, compared with $223 million in FY 1966 and $234 million in FY 1965. . . .

Advanced Development

This category includes projects which have advanced to a point where the development of experimental hardware for technical or operational testing is required prior to the determination of whether the items should be designed or engineered for eventual Service use. In contrast to engineering development where design specifications are employed, advanced development permits the use of performance specifications which provide the contractor greater latitude in meeting the requirement, thereby encouraging innovation. Both the Over-the-Horizon radar and the anti-satellite systems were developed in this category but turned out to be easily convertible to operational systems. To encourage innovation, we plan to continue the advanced development effort at a high level—about $835 million in FY 1967 compared with $830 million in FY 1966 and $588 million in FY 1965.

Army.

The first two items on the Army's list of advanced developments—Operational Evaluation V/STOL and New Surveillance Aircraft—are both part of a broader Defense Department program for the development of experimental prototype vertical, or short, take-off and landing aircraft suitable for operational testing by the three Services.

A combined total of about $380 million has been programmed by the three Military departments for this effort, from its inception through FY 1966. . . .

. . . We have included a total of about $72 million in FY 1967 for V/STOL developments compared with $69.5 million in FY 1966.

The $1 million included under Advanced Development, Army for Operation Evaluation V/STOL in FY 1967 is to cover the Army's cost of testing the XC-142A. The $3 million for New Surveillance Aircraft is for test and evaluation of the P-1127, XV-5A and OV-10A. . . .

For Aircraft Suppressive Fire Systems, $4 million is included in the FY 1967 budget. . . .

The Automatic Data Systems for the Army in the Field program is an effort to develop an integrated command and control information system for field army use by applying automatic data processing techniques to the interrelated functions of fire control, intelligence, operations, logistics and personnel. Four million dollars is requested in the FY 1967 Budget to continue work on various aspects of this effort.

The Surface-to-Air Missile Development (SAM-D), for which funds are included in the FY 1967 Budget, is the advanced missile system designed for use against sophisticated aircraft and short range ballistic missiles. . . . The FY 1967 effort is directed toward the start of Engineering Development, assuming that the current contract definition is successfully completed. In addition, investigations are under way to determine the extent to which common subsystems and components could be developed for both the SAM-D and the Navy's Advanced Surface-to-Air Missile (ASMS).

About $13 million is included in the FY 1967 budget for the Army portion of the Defense satellite communications program. . . .

The Army's Limited War Lab, formerly included in Exploratory Development, will now be carried under Advanced Development. . . . A total of $7 million is requested for the Limited War Laboratory in FY 1967.

Some $11 million is included in the FY 1967 budget for accelerated anti-malarial research to counter the drug resistant malaria now being encountered by our forces in Vietnam.

Navy.

The first two items in the Navy list of advanced developments represent the Navy's participation in the Department of Defense V/STOL development program. The amount requested in the FY 1967 budget for V/STOL development is to continue work on the X-22, which is now being completely funded by the Navy. . . .

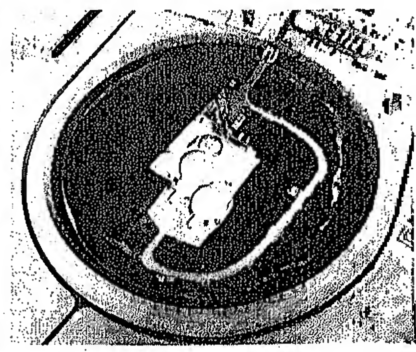
I have already touched upon the next item, the Advanced Surface-to-Air Missile System (ASMS) for which $2 million is requested in FY 1967. . . .

The $2 million requested for the Landing Force Support Weapon (LFSW) is to provide for the flight testing of the Army's Lance missile in a sea environment, i.e., launching the missile from a ship in support of landing forces.

The funds requested for ARM I are to carry forward the development of a new anti-radiation missile system as a follow-on for the Shrike missile. . . . .

Advanced ARM technology is a new effort to be initiated in FY 1967, which looks beyond the ARM I. Four

V/STOL Aircraft XC-142A.



NIKE-X Multi-Function Array Radar.

million dollars is requested to initiate this program in FY 1967.

The $3 million included for Augmented Thrust Propulsion is to continue work on an advanced sea-based deterrent, i.e., a broad program of investigation and applied research focused on possible configurations of future sea-based strategic systems from which an advanced weapon system may eventually evolve.

The $3 million requested for Astronautics in FY 1967 is for the Navy's portion of the Defense satellite communications program, more specifically, for the development of new ship-based terminals. No additional funds are required for the geophysical satellite (Project ANNA).

The remaining items on the Navy's Advanced Development list are all related to anti-submarine warfare. We have included in the FY 1967 budget a total of $355.4 million for ASW RDT&E, $98.5 million of which is for Advanced Development.

The first item in this group, Advanced Undersea Surveillance, includes two projects for which a total of $6 million is requested in FY 1967. The first of these, ASW Surveillance, for which $4 million is requested, is the combination of the Artemis and Trident efforts. . . . The remaining $2 million is required for a new project, Inshore Undersea Warfare, which is designed to explore detection techniques to counter very small underwater craft and frogmen attacking ships, harbor installations and amphibious assault areas.

The next item, Airborne ASW Detection Systems, for which $23 million is requested in FY 1967, includes a number of related projects. . . .

Funds are included in the FY 1967 budget for the development of a number of new sonars for submarines and surface ships, including passive and active sonars with significantly increased performance, reliability and maintainability. Funds are also included for advanced development work to improve the combat effectiveness of current and new torpedoes.

The $4 million requested for Advanced Surface Craft in FY 1967 is for the evaluation of the 110-ton, 45-knot hydrofoil patrol craft (PCH) already completed and the 320-ton, 50-knot hydrofoil auxiliary ship (AG-EH) to be completed this spring. . . .

One of the important efforts being pursued in FY 1967 is the Deep Submergence program for which $22 million is requested. . . .

The program Reactor Propulsion Plants, for which $13 million is requested in FY 1967, covers two major projects. One of these is directed to the development of a "natural circulation" nuclear power plant which would provide a quieter, safer, more reliable propulsion plant for submarines. The second project is directed to the development of a high shaft horsepower nuclear propulsion plant suitable for use on attack carriers. . . .

. . . The Sea Hawk/ASW Escort project is being reduced from a full systems development to work on the principal components. The first of these projects, Combined Gas Turbine Propulsion, is concerned with the overall performance and potentials of ship-based gas turbine machinery. The second is the Active Planar Array Sonar, a sonar which would be built into the hull of the ship, thus providing a much larger radiating and receiving aperture. . . .

. . . The other two elements of this effort are the ASW Ship Command and Control and the ASW Ship Integrated Combat System. . . .

Air Force.

The first five items on the Air Force list of advanced developments are all part of the V/STOL aircraft technology program discussed earlier.

The V/STOL Assault Transport (CX–6) project involves preliminary studies for the development of a full-scale prototype aircraft capable of carrying large payloads over relatively long distances.

The Tri-Service V/STOL development is concerned with the continued operational evaluation of the XC–142A.

The V/STOL Aircraft Technology program for which $3 million is requested in FY 1967, will provide for evaluation of various domestic and foreign V/STOL concepts, designs and equipment with a view towards the eventual design of a common operational V/STOL fighter aircraft. . . .

The V/STOL Engine Development project provides for the development of two different types of engines—the first, a pure lift engine and the second, a lift cruise engine which can deflect its thrust to produce lift during takeoff and landing and also be used for forward propulsion. . . .

The fifth project is the Lightweight Turbojet and is intended essentially to demonstrate the technology for lightweight turbojet engines for various purposes including V/STOL. . . .

The next two projects which were discussed briefly in connection with our future manned bomber defense program—Overland Radar and AWACS—are closely related. The first is concerned with the development of the radar technology which would be needed in airborne warning and control systems such as the Air Force's Airborne Warning and Control System (AWACS) and the Navy's Advanced Airborne Early Warning Aircraft. . . .

The next item is Advanced Filament Composites for which $10 million is requested to provide for the fabrication of test quantities of high strength, lightweight components made of glass fibers. . . . .

The $6 million requested for Reconnaissance Strike Capability is to develop and demonstrate a capability with multiple high-resolution sensors such as side looking radars for both Strategic and General Purpose Forces. . . .

The FY 1967 budget includes $6 million to continue the X–15 project. . . .

The $8 million requested for Advanced ASM Technology, formerly known as Tactical Missile Guidance Development, would provide for the development of both all-weather and fair-weather command and automatic guidance techniques for missiles employed against ground targets. . . .

Ten million dollars is requested in FY 1967 for continued study of the various technological and operational concepts for an Advanced ICBM. . . .

The AMSA program, for which $11 million is requested in FY 1967, was discussed in connection with the strategic bomber forces. . . .

The remaining major items on the Air Force list of advanced developments are all space projects which I discussed earlier.

Engineering Development

This category includes those projects being engineered for Service use, but which have not as yet been approved for production and deployment.

Army.

. . . The $447 million requested for Nike X will continue, on an urgent basis, a reoriented ABM effort emphasizing the development of an austere version of the multi-function phase array radar (TACMAR), the missile site radar (MSR), high speed data processing equipment, the high acceleration Sprint missile and the new exoatmospheric (DM15X2) missile. . . .

The principle element of the next item, Forward Area Air Defense, was the Mauler program which has now been terminated. . . .

Forty-six million dollars is requested in the FY 1967 budget to continue engineering development of a variety of weapons other than missiles. Included in this category is the Special Purpose Individual Weapon (SPIW) which may be considered as a possible replacement for

the M-14 rifle and M-79 grenade launcher. Competitive models are under development and the better of the two will be selected in FY 1967. In a related effort, an evaluation of all competing small arms weapons, including SPIW, is being conducted to determine the best successor to the present small arms family. Recommendations from this evaluation, expected in July 1966, may affect the decision to complete the SPIW project. Development of the 107mm Heavy Mortar as a replacement for the current 4.2-inch mortar is continuing. . . .

Another major effort is the Medium Anti-tank Weapon (MAW) system. Two competitive systems have been considered and a final selection has been made. Active development will commence this year.

A new major development in artillery weapons is the 155mm lightweight Close Support Weapons System. . . .

The next two items, Aircraft Suppressive Fire System and Advanced Aerial Fire Support System, are closely related. The former, for which $16 million is requested, is concerned with the development and adaptation of weapon sub-systems for Army aircraft; and it was under this program that the presently operational helicopter armament systems were developed. During FY 1966 we initiated development of a second generation hard point target weapon system, TOW, to replace the French developed and produced SS-11 anti-tank missile which had been adapted to helicopter use. Preliminary design release and the delivery of two TOW systems, adapted to a helicopter, are expected during the latter part of FY 1967 and will undergo development tests. The Advanced Aerial Fire Support System project involves engineering development of a completely integrated armed "helicopter-like" system as a replacement for the present improvised armed UH-1B system. . . .

The $2 million provided in FY 1966 for Tactical Transport Aircraft will complete the development and evaluation of the CV-7 (Buffalo). . . . We have decided not to produce and deploy this aircraft since other aircraft are available to meet Army needs.

The $14 million requested for Combat Surveillance and Target Acquisition includes a number of different projects. Development is proceeding with a hand-held radar for the detection of moving vehicles and personnel in forward combat areas, and a standardized tactical image processing and interpretation system. A contract for test models of a new type of sound ranging equipment to help locate hostile weapons will be awarded in FY 1967. Tests of a new unmanned aerial surveillance system, designed to provide target coverage when the weather or enemy action restricts manned aircraft flights, were conducted last year and we will now begin studies of more advanced concepts in this area.

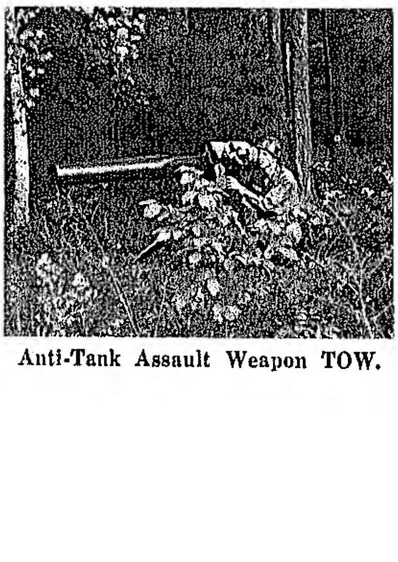
Thirty million dollars is requested for Communications and Electronics. Included in this element is the development of strategic and tactical communications equipment to provide an integrated theater army communications network interconnecting with the world-wide Defense Communication System. Funds are included for the night vision effort which offers, in addition to an early increase in operational capability, a definite possibility of a second generation of such equipment. Provision is also made for the support of an interim air traffic control system, the development of automatic data processing equipment, etc.

The funds included in the FY 1967 Budget for the Heavy Anti-Tank Assault Weapon (TOW) will provide for an expanded test program needed to ensure a high level of reliability for this front line weapon system.

Navy.

The first item on the Navy's list, Poseidon, was previously discussed in connection with the Strategic Offensive and Defensive Forces. The approximately $300 million requested in the FY 1967 budget will provide for the accelerated program designed to meet the planned operational availability date. Total development cost is estimated at $1.2 billion.

The funds requested for Point Defense Surface Missile System (PDSMS) will support a two-pronged effort—a near term, flexible air defense system for the many smaller ships which presently have no onboard capability of their own, and a follow-on effort to provide a significantly better system for the future. . . .



Anti-Tank Assault Weapon TOW.

The next four items on the Navy's list of engineering developments are all associated with undersea warfare and, in total, amount to $70 million in FY 1967. The largest single effort in this category is the development of the MK-48 torpedo. . . .

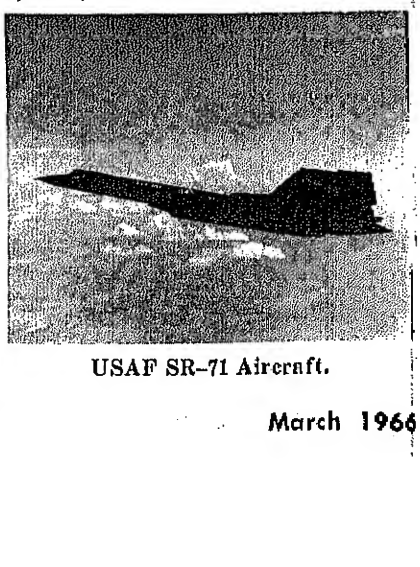
The next item provides for the development of a sonobuoy capable of giving the bearing of a target directly to the attacking aircraft. . . . The funds requested for FY 1967 will essentially complete this effort which was begun last June with $2 million of FY 1965 emergency funds.

The funds included in the FY 1967 request for ASW Rockets are for the development of a rocket boosted ballistic flight missile which will be compatible with the ASROC launcher and fire control system and will have an increased effective range. Contract definition and the start of engineering development are planned for FY 1967.

Other ASW engineering developments include a passive sonar system for submarines which will improve reception of acoustic signals and detection and classification of emitting objects. Also included in this category are a number of mine warfare developments, including new mine firing devices, mine hunting sonars and the use of helicopters to sweep sea mines.

The $8 million requested for Unguided/Conventional Air Launched Weapons will support such ordnance development efforts as Fireye, an improved fire bomb and Snakeye II, a second generation retarded bomb.

The $12 million requested in FY 1967 for Marine Corps Developments includes: an amphibious assault personnel carrier capable of transporting infantry weapons and supplies through very rough surf; a landing force amphibious support vehicle for rapid movement of supplies and equipment from ship to shore and over land; a light-weight helicopter-transportable, high performance ground radar; an automated system for integrating air support activities into the Marine Corps tactical data system; and a new data transmission



USAF SR-71 Aircraft.

system for use with standard communications equipment.

The COIN/LARA (OV-10) aircraft, discussed in this section last year under the heading Special Warfare Navy Aircraft, is now an operational systems development and will be placed in production. We are presently studying the possibility of a larger transport version of this aircraft.

Air Force.

I have already discussed most of the Air Force engineering developments in connection with other programs.

The funds requested for the J-58 engine will continue the development of this advanced power plant used in the SR-71 and the YF-12. . . .

. . . The $18 million for the XB-70 in FY 1967 is for the Defense Department's share of a follow-on test program to be pointly funded with NASA. This program, which would extend through FY 1968 at a total cost of about $54 million, would provide experimental data on structures, engines, aero/thermodynamics, etc., for large aircraft in supersonic flight.

The $4 million requested for Close Support Fighter will carry forward preliminary studies of an advanced fighter attack aircraft for both the Navy and the Air Force.

Funds are also included in the FY 1967 budget for the continued development of the YF-12A and the ASG-18/AIM-47A fire control and air-to-air missile systems already installed in that aircraft and for the adaptation of these systems to the F-12 airframe.

The FY 1967 budget provides for a wide variety of techniques designed to improve the capabilities of our strategic missiles to penetrate anti-missile defenses as well as to improve their accuracy and overall weapon system effectiveness. . . .

As previously mentioned, the Mark II Avionics project has been moved this year from Advanced to Engineering development. . . .

. . . Now undergoing contract definition, we expect to select a development contractor this year. The Mark II will have many of the same components of the Navy's Integrated Light Attack Avionics System (ILAAS).

For Nike-Zeus Targets to support the Nike X development program, $8 million is requested for FY 1967. . . .

The $11 million requested for the Joint Advanced Tactical Command and Air Control System will provide for a new program to develop a family of standard equipment such as displays, computers and communications items for use in the tactical command and control systems of all the Services. . . . The funds requested will initiate the development phase and permit the determination of the joint funding program for future years.

Management and Support

Army.

About $90 million is requested for the support of the White Sands Missile Range. . . . A major effort at this facility is the range instrumentation improvement program, now in its second year, which will refine the data collection capability and augment the range communication system.

We are also requesting $33 million for the Kwajalein Test Site, now operated by the Army. We are now developing a capability at this site to recover re-entry vehicles that impact in the lagoon.

The $195 million requested for General Support covers the costs of all Army R&D installations and activities other than White Sands and Kwajalein. . . .

Navy.

The Pacific Missile Range with headquarters at Point Mugu, California, is responsible for range scheduling, communications, weather and meteorological services and data reduction in support of assigned missile and space launch operations in the Pacific. . . . The FY 1967 request of $72.7 million is $1.4 million more than currently programmed for FY 1966. . . .

The Atlantic Undersea Test Evaluation Center (AUTEC) will have three underwater test ranges sited in a deep sea canyon off the Bahamas, designed to test weapons, sonars and acoustics systems. The $12 million request for FY 1967 is $4 million more than the current FY 1966 program, primarily because of higher construction requirements next year. . . .

Air Force.

For the Eastern Test Range, $205 million is requested in FY 1967, somewhat lower than for the current fiscal year. . . .

. . . About $70 million is requested for FY 1967 to support the Air Force Western Test Range (AFWTR) which consists of a complex of instrumentation networks supporting Air Force, Navy and NASA launches from Vandenberg Air Force, Base, Point Arguello and Point Mugu.

General Support, including Development Support, will require $612 million in FY 1967. . . .

Financial Summary

The Research and Development Program, including the development of systems approved for deployment, will require $6.9 billion in New Obligational Authority for FY 1967. A comparison with prior years is shown below.

($ Billions, Fiscal Years)

	1962 Actual	1963 Actual	1964 Actual	1965 Actual	1966 Est.	1967 Proposed
R&D—except systems approved for deployment	4.2	5.1	5.4	4.9	5.3	5.5
R&D—systems approved for deployment	2.6	2.5	2.2	2.0	2.1	1.9
Total R&D	6.8	7.6	7.6	6.9	7.4	7.4
Less: Support from other appropriations	−0.5	−0.5	−0.5	−0.4	−0.5	−0.5
Total RDT&E (TOA)	6.3	7.1	7.1	6.5	6.9	6.9
Less: Financing Adjustments	−0.9	−0.1	−0.1	—	−0.1	—
Total RDT&E (NOA)	5.4	7.0	7.0	6.5	6.8	6.9

DEPARTMENT OF DEFENSE

Brig. Gen. Woodrow W. Vaughan, USA, will become Asst. Dir. for Plans, Programs and Systems, Defense Supply Agency, early in April. He will replace **Maj. Gen. Victor J. MacLaughlin, USA,** who is to be Commanding General; Fort Lee, Va.

Capt. J. C. Hetler, SC, USN, has assumed duty as Dep. Asst. Dir, for Plans, Programs and Systems, Defense Supply Agency. He replaced **Brig. Gen. Joseph S. Reynaud, USMC,** who has retired.

Maj. Gen. John C. Meyer, USAF, formerly Commander, 12th Air Force, has been assigned as Dep. Dir., The Joint Staff, Office of the Joint Chiefs of Staff.

DEPARTMENT OF THE ARMY

Lt. General William W. Dick, Jr., Chief of Research and Development, will become Commanding General, Allied Land Forces, Southeastern Europe, on April 1. He will succeed **Gen. John H. Michaelis.** Gen. Michaelis has been named Commanding General, Fifth U.S. Army, succeeding **Lt. Gen. Charles G. Dodge,** who is retiring.

Maj. Gen. Austin W. Betts, who has been Dep. Chief of Research and Development, has been nominated for promotion to lieutenant general and assigned as Chief of Research and Development replacing Gen. Dick.

Lt. Gen. Theodore J. Conway, who has been Asst. Chief of Staff for Force Development, has succeeded **Lt. Gen. William W. Quinn** as Commanding General, U.S. Seventh Army. General Quinn has retired.

Lt. Gen. James H. Polk, Commanding General of the V Corps, Europe, has been designated Asst. Chief of Staff for Force Development. His successor as Commanding General, V Corps, Europe, is **Lt. Gen. George R. Mather,** who has been U.S. Representative to the Permanent Military Deputies Group of the Central Treaty Organization.

Dr. Lawrence W. Wallace, Special Asst. for the Top Management Seminar at the Army Management Engineering Training Agency (AMETA), Rock Island Arsenal, has retired. Dr. Wallace, who retired with 15 years of Federal service at the age of 85, will continue as a consultant and adviser to AMETA.

Col. Vern E. Johnson, former Chief of the Security and Investigation Div., Office of the Provost Marshal General, has assumed new duties as the Provost Marshal and Security Officer of the U.S. Army Strategic Communications Command.

Col. Edwin I. Donley has been nominated for promotion to the rank of brigadier general and assigned as Dep. Commander for Land Combat Systems of the Army Missile Command, Redstone Arsenal, Ala. He replaces **Brig. Gen. Charles W. Eifler,** now serving in Vietnam.

ABOUT PEOPLE

Col. Bernard R. Luczak, former Project Manager of the SAM-D Air Defense System, has been nominated for promotion to the rank of brigadier general and assigned to the Army Ammunition Procurement and Supply Agency, Joliet, Ill. His replacement as SAM-D Project Manager is **Col. Edward M. Dooley.**

Brig. Gen. Carroll H. Dunn, who was selected for promotion to major general last fall, has been designated Dir. of Construction, Military Assistance Command Vietnam.

Col. N. A. Lord will become the Canaveral District Engineer, Merritt Island, Fla., effective in early May.

Lt. Col. James A. Hill, former Dep. Commander of Rock Island Arsenal, has been appointed Dir. of Research and Development, U.S. Army Weapons Command. He succeeds **Col. George D. Carnahan,** who has retired.

DEPARTMENT OF THE NAVY

Veteran naval aviator RAdm. Henry L. Miller, 53 will become the Navy's Chief of Information on April 12.

Adm. Miller comes to Washington after serving 18 months as Commander Carrier Division 3, the Seventh Fleet's task group operating off the coast of Vietnam.

Led by the world's largest aircraft carrier, atomic powered USS Enterprise (CVAN-65), Carrier Division 3, also called Task Group 77.7, is the Navy's main striking force supporting operations in Vietnam.

The new Chief of Information is a native of Fairbanks, Alaska. During World War II he served as a naval flyer in the Pacific. He has been awarded the Legion of Merit twice and the Distinguished Flying Cross five times.

Dr. Gerald W. Johnson has been appointed Dir. of Naval Laboratories, a newly created post. Dr. Johnson was formerly associated with the Lawrence Radiation Laboratory Livermore, Calif., where he was Associate Dir. for peaceful application of nuclear power. In his new position Dr. Johnson will be the principal advisor to the Asst. Secretary of the Navy (Research and Development) and have managerial responsibilities for Navy research and development laboratories.

RAdm. William P. Mack, Chief of Information, has been reassigned as Commander, Amphibious Group Two. His successor as Chief of Information will be **RAdm. Henry L. Miller,** Commander, Carrier Div. Three.

Brig. Gen. Earl E. Anderson USMC, has been assigned as Dep Chief of Staff (Research, Development and Studies), Hq., U.S. Marine Corps. He replaced **Brig. Gen. Wood B. Kyle, USMC.**

DEPARTMENT OF THE AIR FORCE

Maj. Gen. Frederick R. Terrell Commander, 30th NORAD Region and 30th Air Div. (SAGE), Truax AFB, Wis., will become Dep. Chief of Staff, Plans and Policy for North American Air Defense Command and Continental Air Defense Command effective April 1.

Brig. Gen. Ralph C. Rockwood Commander, San Bernardino Air Materiel Area, Norton AFB, Calif., has retired.

Nurses Sought for Military

The Department of Defense has authorized the Military Departments to increase their recruiting efforts for both male and female nurses because of current strength buildup and the need for increased medical services in Southeast Asia.

Warrant officer appointments are available to qualified civilian nurses male or female, having two years of training and E-5 or sergeant grade appointments to qualified civilian licensed practical nurses with one year of training.

Interested nurses may contact the nearest Armed Forces Recruiting Office or write to the Surgeon General of the Army, Navy or Air Force.

FROM THE SPEAKERS ROSTRUM

Address by General Creighton W. Abrams, Jr., USA, Vice Chief of Staff, U. S. Army, at the West Point Society Luncheon, New York, N. Y., Jan. 25, 1966.

Gen. Creighton W. Abrams, Jr., USA.

The Strategy of Communist China

The most recent pronouncements from Peking recall to mind the fact that many people did not appreciate the true nature of the Japanese threat in the 1920's and 1930's or the significance of Hitler's pronouncements in the 1930's and especially his grand design as outlined in Mein Kampf. I believe and hope we have learned that particular history lesson, but there is still some danger that the sinister, ruthless and long-term nature of the Chinese communist threat may not be appreciated.

About 167 years ago, the Philadelphia Monthly Magazine wrote about a civil war reportedly going on in China. What was written then may be true in part today. "Our knowledge of that nation is little, and that little too obscure to be trusted."

In his treatise, "On Protracted War," written in 1938, Mao Tse-tung wrote:

"It is extremely important to keep the enemy in the dark about where and when our forces will attack. This creates a basis for misconceptions and unpreparedness on his part."

You will recall that it was in early 1961 that Mr. Khrushchev, then Premier of the USSR, held a congress in Moscow with representatives of 81 world communist parties. In a major policy statement to that congress, Mr. Khrushchev acknowledged that the Soviet communists recognized the dangers inherent in not only nuclear war, but in local wars as well. Although the Soviet leader preached caution with respect to general and local war, he strongly advocated so-called "wars of liberation" as the most effective current means to promote the communist cause.

Although this pronouncement came at a time when the Soviet and the Chinese communist leaders were growing farther and farther apart in their views on how world communism should be propagated, the idea of "wars of liberation" or "people's wars" was right down the line for the Chinese communists, because Mao Tse-tung in great part owed his political position and power as leader of Red China to the pursuit of such a route. Whereas the Russian Revolution of 1917 drew upon the urban workers and the defeated military forces of Russia for its manpower, the Chinese communists did it the other way. Admittedly, the following comparison is oversimplified, but where the Bolshevik workers' army spilled a considerable amount of revolutionary blood overcoming vast areas of Russia and its rural peasantry, the Chinese communists founded their movement in the rural population. Then they isolated, overcame and occupied the major cities of mainland China.

Whether this pattern of internal conquest was by accident or design we may never really know. But in any event, it had its effect upon the Red Chinese strategists who have adopted it as the basis for a militant and aggressive foreign policy. Through a recent article written by Marshal Lin Piao, Mao has broadcast his basic strategic doctrine to the world. I should like to quote from Marshal Lin's article.

"Taking the entire globe, if North America and Western Europe can be called 'the cities of the world,' then Asia, Africa and Latin America constitute 'the rural areas of the world.' . . . In a sense the contemporary world revolution also presents a picture of the encirclement of 'cities' by the 'rural areas.' In the final analysis the whole cause of the world revolution hinges on the revolutionary struggle of the Asian, African and Latin American people who make the overwhelming majority of the world's population."

This goal of global conquest may seem impossible for the Red Chinese to attain, but so were the goals Hitler set out in Mein Kampf. However, if Mao and his supporters believe they can attain them—as Hitler did—then the actions Mao may take can create serious threats to world peace, as he has already done in Korea, Tibet and India.

To lend support to the fact that Mao believed Red China will eventually triumph, one needs only to recall his background. For about 22 of Mao Tse-tung's 72 years, he led long—and at times seemingly hopeless—armed struggle against superior forces. In 1927, after briefly working with the communists, Chiang Kai-shek destroyed their cadre in the major cities. Mao salvaged the pieces and from 1927 to 1933, he waged guerrilla warfare against the Nationalist Chinese from rural bases in the mountains of South China. By 1933, Chiang Kai-shek's army totaled about one million men, but Mao's army, relatively small and poorly trained, held out against five attempts by the Nationalists to encircle it. However, by 1934, Mao's position was so precarious that he left his bases in South China and began the legendary Long March to the North. From October 1934 to October 1935, Mao's army marched about 7,500 miles over rugged terrain, while also defending itself against the Nationalists.

Two years after completing the march, Mao led his army against the invading Japanese. By mobilizing the peasants and by skillfully working on nationalist sentiment, Mao used guerrilla warfare to harass the invading Japanese. Although nominally allied with Chiang Kai-shek against the Japanese, Mao continued his political struggle against the Nationalists and, in addition, fought three major military engagements against the Nationalists in 1939, 1941 and 1943.

History shows that the communists are patient and that they view their ultimate goals from the long term viewpoint. That Red China's first objective is to dominate Asia, there can be little doubt. This is supported by an item in the Congressional Record of April 29, 1954, which is purported to be a summary of a memorandum written by Mao Tse-tung and carried to Moscow by Foreign Minister Chou En-lai in March 1953.

"It appears that time has come that we have to look upon Asia as our immediate goal. Under the present circumstances, any vigorous action in Europe such as internal revolution, effective infiltration, or intimidation into inaction or submission is now impossible. . . . In Asia, on the contrary, such tactics will yield an abundant harvest."

In light of what happened a year later, the next quote from the memorandum is most interesting.

"The military operations in Indochina should be carried out . . . to make the war extremely unpopular among the French people and to make the French and Americans extremely hateful among the Indochinese people. The object is to force the French to back out of Indochina preferably through the face-saving means of an armistice. Once foreign intervention is out of the picture, . . . infiltration, forming united fronts with the progressive elements in and outside the reactionary regimes will accelerate the process of liberation."

The global nature of Red China's ambitions is evident today in its vocal encouragement of dissidence and civil strife, particularly in the underdeveloped world, and in its promotion of the formation of factions embracing Chinese communist revolutionary theory, or nationalist communist movements wherever possible. Some of these attempts have failed miserably; others have succeeded to the point of winning entire nationalist communist parties to Peking's viewpoint in its dispute with Moscow.

Why this effort so far from mainland China?

Marshal Lin again gives us the answer, and I quote:

> "The more successful the development of a people's war in a given region, the larger the number of U. S. . . . forces that can be pinned down and depleted there. When the United States . . . are hard pressed in one place, they have no alternative but to loosen their grip on others. . . . The peoples of Asia, Africa, Latin America and other regions can destroy it piece by piece, some striking at its head, and others at its feet. That is why the greatest fear of the United States . . . is that people's wars will be launched in different parts of the world. . . ."

General Giap of North Vietnam has said of the conflict in South Vietnam:

> "South Vietnam is the model of the national liberation movement of our time . . . If the special warfare that the U. S. imperialists are testing in South Vietnam is overcome, then it can be defeated everywhere in the world."

This then is the character of the Red Chinese threat. It is global in concept, total in its dimensions, determined, implacable and insidious in its actions.

Communist China is using Hanoi's manpower to make South Vietnam their major test case to prove that aggression by proxy cannot be stopped.

The Chinese communist support was a major factor in the Viet Minh fight against the French, so their continued support of Hanoi today is not unusual. Marshal Lin reaffirmed this support when he wrote:

> "The determination of the Chinese people to support and aid the Vietnamese people in their struggle against the United States . . . is unshakable."

After the Chinese communists had won control of the Chinese mainland in 1949, they began giving substantial assistance to the Viet Minh. They established training centers in southern China where Viet Minh guerrilla forces were organized, trained and amply supplied with weapons, including machine guns, mortars and pack howitzers. By August of 1950, the Chinese had equipped and trained three regular Viet Minh divisions, which by the end of the year had attacked and destroyed the chain of French posts guarding the north Indo-China border.

The Viet Minh cause was indirectly aided by the entrance of Communist China into the Korean War, because Chinese war industries were expanded, and the construction of roads and railroads was speeded up. Although the bulk of the new military supplies went to aid the Chinese armies in Korea, more supplies were also made available to the Viet Minh guerrillas.

Following Dien Bien Phu and the Geneva Accords in 1954, the communists consolidated their gains in North Vietnam, developed forward storage depots, staging areas, and constructed roads and bridges to improve their lines of communication. The successful Viet Minh offensives, in eastern Laos in 1953 and 1954, resulted in the northern third of South Vietnam being strategically outflanked, since it gave the communists access to what we now call the Ho Chi Minh trail. The Geneva Accords also provided a convenient tactical pause to enable the Viet Minh to organize the Viet Cong insurgency.

In assessing the operations in Vietnam today, it is important to remember that from 1950 to 1954, Viet Minh combat operations were conducted against the French and Vietnamese in South Vietnam, in many of the same areas where there has been heavy fighting recently. After the Geneva Accords in 1954, many of the Viet Minh stayed in South Vietnam to infiltrate the governmental structure at all levels, and to prepare the way for an eventual communist take-over. The continued discovery of extensive tunnels, arms factories, field hospitals, arms and food caches is evidence of the extent to which the communists have developed operational bases inside South Vietnam. The most recent discovery was the large, division-size tunnel complex found by the 1st Infantry Division, only 25 miles north of Saigon.

The pattern of enemy combat operations shows that the number and intensity of battalion and larger-size unit attacks have increased every year since 1962, while the company and smaller-size attacks have decreased. Terror and sabotage attacks also have increased steadily since 1962. The terrorist attacks, which concentrate on local officials, administrators, school teachers, health worke and police are aimed at the ver foundation of the nation-buildin process. For example, in 1965, ther were over 20,000 known Viet Con incidents of terror and over 4,000 i cidents of sabotage.

Hanoi is sending more men sout because this is the best way they ha to offset partially the mobility an firepower advantage that our use helicopters, artillery and airpow gives us. This enemy strategy wou be dependent on both the suppli they have stocked in South Vietna and on substantial infiltration of su items as weapons and ammunition. could be a stop-and-go affair over long period of time, by alternati their attacks with pauses to rebui their strength.

Against the background which have outlined, I would like to discu what is being done from the militar social, political and economic vie points to combat communist aggre sion in South Vietnam. The milita operations appear to dominate t scene at the present time, but t other programs are going on concu rently. In his report following h recent trip through Asia, Senat Mansfield said:

> "General Nguyen Cao Ky, th Prime Minister, recognizes that purely military solution to th problems of Vietnam is not possi ble. Security and social and eco nomic reform, in his view, mus proceed hand in hand in order t gain the support of the people."

However, it is also recognized th with the escalation of Hanoi's mil tary commitment, South Vietnam success in gaining and maintaini control of the some 9,000 to 10,000 v lages in the countryside is depende in great part upon the success military operations. Conversely, t social, economic and political pr grams, which the military operatio are supporting, also contribute to t success of military operations. Secu ity must be provided in the countr side if the nation-building process are to move forward.

From our bases along the east coa such as Da Nang and Cam Ranh Ba and from our inland bases at Saigo Pleiku and An Khe, the allies a extending their control over the su rounding areas to provide a mo secure environment in which Vie namese nation-building can take pla It is often difficult to be sure whe the loyalties of a village lie, or determine if the Viet Cong local su versive organization has been d stroyed.

One result of our buildup in suppo of the Vietnamese effort has been t United States-government of Vietna capability to increase the number a scope of search and destroy ope tions. The Viet Cong are being hun down in areas where they had pre ously been safe from attack. The cent joint American-Australian ope tions, in the Iron Triangle area no of Saigon, is a good example of th

as was the 1st Cavalry Division's fight near Chu Pong mountain.

Next I will point out some things being done in the social, political and economic areas, but as with the military operations, the exact progress being made is not always easy to evaluate. Psychologically, the arrival of large numbers of American combat troops has had a positive effect on government-held areas. This is seen in the improvement of morale in the government, in the armed forces and in the return of confidence among many Vietnamese civilians. At the same time we are being very careful that our actions embellish rather than detract from the basic premise that ultimately victory will depend on government of Vietnam efforts, civil as well as military.

Concurrently, there has been a period of government stability which is essential if public confidence and support are to be maintained. This increased stability not only contributes to the effective prosecution of the war, but also makes it easier to carry out the necessary economic, social and political reform programs. After the fall of the Deim government, the pacification program to bring political, economic and social organization into the hamlets lapsed for awhile. Besides the renewed rural reconstruction program, which is regarded as a more thorough and realistic effort than before, other programs to improve the welfare of the people are under way. For example, a program to redistribute 700,000 acres of land to 180,000 farmers is under way. It is generally recognized that it will take time to make any substantial political gains among the uncommitted part of the population with these programs, but we have to be patient also and, as Captain Spruill wrote home before he was killed: "For us to despair would be a great victory for the enemy."

The Vietnamese government has also instituted a resources control program, to restrict the flow of supplies to the Viet Cong, but in many parts of Vietnam, particularly in the fertile and densely populated Delta, there is plenty of food for everyone.

Senator Mansfield, in his report on January 9, summarized the basic problem that has accompanied the increase in military operations by both sides:

"The ravages of war and terrorism, however, are taking a toll of the country's productive capacity. Rice fields and rubber plantations in areas that are being bombed and fought over no longer produce their contribution to feed the people and to nourish the economy. Fledgling enterprises in outlying areas, cut off from supplies and from markets by interrupted communications, wither and fail."

Note that the social, political and economic programs which I have mentioned are being planned and carried out by the Vietnamese government, though we are giving all the advice and assistance we can. But in the long run, the Vietnamese are the ones who must make these programs work and it is the Vietnamese government which must eventually win the loyalty of the people, regardless of the amount of assistance we and other nations provide. To this end, American assistance to the people is channeled through the Vietnamese government.

Though our military forces have conducted many recent military operations, they are also contributing to the effort to win the loyalty of the people. For example, military medics treat thousands of villagers, besides teaching them basic first aid and hygiene. Soldiers in many units have contributed funds to support orphans, to help refugees and to help villages adjacent to their areas. Our helicopters have flown countless missions of mercy to evacuate refugees, to carry food to isolated areas and to evacuate wounded civilians. These are only a few of the many contributions, which when added together, are bound to have a beneficial effect on winning the people's loyalty. The language barrier is a hindrance at times, but acts of decency and human kindness speak for themselves and people are pretty much the same the world over in their response.

I do not have any doubt but that our nation has the means to support our commitment in Vietnam, both in terms of manpower, money and perseverance. Our nation and many of our allies are all too familiar with what the preservation of our freedom and our way of life have cost in the past. No one can place a price tag or a ceiling on the cost of freedom—and I believe the eventual freedom of a large part of the Free World is now being decided in Vietnam.

We must all realize that the Chinese communists' challenge to the Free World in South Vietnam today is another example of their insatiable greed for power and world conquest. What is our answer to Mao Tse-tung's announced strategy of eventual world conquest? The Honorable Cyrus Vance, our Deputy Secretary of Defense, provided a straightforward answer in a speech last October when he said:

". . . we agree that Mao's clear intent is that his brand of communism should eventually surround, encircle, and finally cut off and defeat western Europe and the United States.

"But we disagree that that is going to happen. Our defenses are strong, and we remain alert and ready for whatever the future may bring. But more important is the fact that the free nations of the world offer a better future for the individual, and a peaceful path to that future."

We need a thoughtful appreciation of the real nature of the Chinese communist menace—an understanding of their objectives and their philosophy; but equally important, as we have throughout our history from Lexington and Concord, Bunker Hill, Chateau-Thierry, Guadalcanal, Normandy and the Pusan perimeter, we must maintain the will to preserve our own ideals and beliefs, because as The Reverend Dean Sayre said of the current conflict in Vietnam:

". . . It is . . . the momentary focal point of a titanic struggle to determine in every valley of earth whether man can fulfill the image that God has imprinted on his brow, or whether he must ever remain under the bondage of blindness and human chicanery."

U.S.-U.K. Reach Agreement

on R&D of Communications Satellite Project

The United States and the United Kingdom have signed a Memorandum of Understanding which provides for participation by the British in research and development associated the U.S. Initial Defense Communications Satellite Project.

U.S. Secretary of Defense Robert S. McNamara and U.K. Minister of Defence Denis Healey signed the memorandum as part of a continuing program of joint cooperation on mutual defense and space research.

Under the terms of the memorandum Great Britain will provide several ground terminals for communications tests and experiments using the U.S. Defense Department communications satellites. Costs of providing and operating these terminals will be borne by the United Kingdom. No charge will be made for their use of the communications satellites for these tests. The memorandum also provides for a mutual exchange of data resulting from this cooperative program.

The U.S. Initial Defense Communications Satellite Project provides for establishment of a space system of up to 22 communications satellites in near-synchronous, equatorial orbits. Satellite launches are planned for this year.

The U.S. Defense Communications Agency and the U.K. Office of the Assistant Chief of Defense Staff (Signals) have been designated as the project offices to handle program details and coordination for their respective governments.

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MAY 1966

SPEAKERS CALENDAR

OFFICE OF THE SECRETARY OF DEFENSE

Dr. Chalmers W. Sherwin, Dep. Dir. (Research & Technology), Office of Dir., Defense Research & Engineering at National Science Foundation and Richardson Foundation National Research Conference, Greensboro, N. C., March 26; at Research Applications Conference of the Office of Aerospace Research, Washington, D. C., April 5.

Mr. Edward T. Cook, Dep. Dir., Defense Contract Audit Agency, at National Contract Management Assn. Symposium, Los Angeles, Calif., April 15.

Lt. Gen. William J. Ely, USA, Dep. Dir. (Administration & Management), Office of Dir., Defense Research & Engineering, at Industrial College of the Armed Forces, Washington, D. C., April 7.

Mr. William B. Petty, Dir., Defense Contract Audit Agency, at National Contract Management Symposium, Washington, D. C., April 16; at Los Angeles Chapter Meeting, California Society of Certified Public Accountants, Los Angeles, Calif., May 17.

DEPARTMENT OF THE ARMY

Maj. Gen. David P. Gibbs, Chief of Communications-Electronics, at Armed Forces Communications Electronics Assn. Meeting, Fort Monmouth, N. J., April 4–5; at Institute of Electrical and Electronics Engineers Conference, Fort Huachuca, Ariz., April 27.

Lt. Gen. L. J. Lincoln, Dep. Chief of Staff for Logistics, at Industrial College of the Armed Forces National Security Seminar, Pittsburgh, Pa., May 19–20.

DEPARTMENT OF THE NAVY

RAdm. Eugene Fluckey, Commander, Submarine Force Pacific Fleet, at Navy League Meeting, San Diego, Calif., April 11.

VAdm. C. B. Martell, Dir., Anti-Submarine Warfare Programs, Office, Chief of Naval Operations, at American Ordnance Assn. Meeting, White Sands, N. M., April 20.

DEPARTMENT OF THE AIR FORCE

Gen. B. A. Schriever, Commander, Air Force Systems Command, at American Institute of Aeronautics and Astronautics Meeting, Cocoa Beach, Fla., April 19; at American Ordnance Assn. Meeting, Washington, D. C., May 5.

Lt. Gen. L. I. Davis, Commander, National Range Div., Air Force Systems Command, at Institute of Navigation Meeting, Boston, Mass., April 21.

Lt. Gen. K. K. Compton, Dep. Chief of Staff, Plans & Operations, at American Ordnance Assn. Meeting, Washington, D. C., May 5.

Maj. Gen. C. H. Terhune, Jr., Commander, Aeronautical Systems Div., Air Force Systems Command, at American Ordnance Assn. Meeting, Washington, D. C., May 5.

Maj. Gen. B. I. Funk, Commander, Space Systems Div., Air Force Systems Command, at General Dynamics/Convair, San Diego, Calif., May 11; at Aero Club Meeting, Buffalo, N. Y., May 20.

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff, Systems & Logistics, at Armed Forces Day Observance, Sacramento, Calif., May 19; at Hennessy Trophy Award, Chicago, Ill., May 22; at American Institute of Industrial Engineers Meeting, San Francisco, Calif., May 26–27.

Gen. J. P. McConnell, Chief of Staff, at Armed Forces Day Observance, New York, N. Y., May 21.

NATO Special Committee Working Group Meets in Washington

The Nuclear Planning Working Group of the NATO Special Committee of Defense Ministers met for a two-day session on Feb. 17–18 at Washington, D.C., to discuss nuclear planning for the defense of the alliance.

Ministers attending the first meeting of the working group were Kai-Uwe von Hassel, Germany; Guilio Andreotti, Italy; Ahmet Topaloglu, Turkey; Denis Healey, United Kingdom; and Robert S. McNamara, United States, chairman of the group. Manlio Brosio, NATO Secretary General and Chairman of the Special Committee, also attended.

For its initial meeting the working group concentrated its attention on questions concerning planning with regard to strategic nuclear weapons. This included an appraisal of the process by which the threat to NATO is measured; consideration of the ways in which nuclear forces are planned, procured and managed; discussion of problems and procedures in the development of plans with respect to such forces as well as the command and control arrangements which govern them.

The discussion of the strategic nuclear threat against NATO and the forces available to counter the threat included a detailed examination of targeting procedures, planning with respect to allied strategic forces and an evaluation of what the various kinds of forces could be expected to achieve under different conditions of nuclear war.

The special committee is a part of an effort to increase the participation of NATO nations in allied nuclear planning and policy. It was established by decision of the North Atlantic Council following a proposal made by Secretary McNamara to the Defense Ministers' Meeting in Paris May 31–June 1, 1965.

The first meeting of the full committee was held Nov. 27, 1965, in Paris, at which time three working groups were established. The Special Committee's Working Groups on Intelligence and Data Exchange and on Communications met in Paris Feb. 7–9. These meetings and the meeting of the Nuclear Planning Working Group just concluded are additional steps to improve and extend allied participation in planning with respect to nuclear forces, including strategic forces, and to ensure that agreed consultation concerning the decision whether to use nuclear forces can take place as expeditiously as advanced technology will permit.

The Working Group for Nuclear Planning will meet next in London at the end of April. Recommendations reached by the working group will be submitted to the North Atlantic Council through the Special Committee of Defense Ministers.

CALENDAR OF EVENTS

March 23–25: Armed Forces Management Assn. System Effectiveness Seminars, Washington, D.C.

March 24–25: American University Washington Conference on Business-Government Relations, Sheraton-Park Hotel, Washington, D.C.

April 5–6: Armed Forces Communications Electronics Assn.-U.S. Army Eelctronics Command Symposium, Fort Monmouth. N.J.

April 11–15: Institute of Environmental Sciences Meeting, San Diego, Calif.

April 12–13: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, San Francisco, Calif.

April 18–20: 1966 Local and Short Haul Carriers National Exposition, Sheraton Park Hotel, Washington, D.C.

April 18–21: Aerospace Medical Assn. Meeting, Las Vegas, Nev.

April 27–28: DOD-National Security Industrial Assn. Advanced Planning Briefings for Industry, Washington, D. C.

April 28: Property Administration Assn. Annual Seminar, Hotel New Yorker, New York City.

May 1–4: American Institute of Chemical Engineers Meeting, Columbus, Ohio.

May 5: American Ordnance Assn. Annual Meeting, Washington-Hilton Hotel, Washington, D.C.

May 9–11: National Aerospace Electronics Conference, Dayton, Ohio.

May 10–12: National Telemetering Conference, Boston, Mass.

May 11–13: American Helicopter Society Meeting, Washington, D. C.

May 16–20: American Society of Civil Engineers Meeting, Denver, Colo.

May 17–19: National Security Industrial Assn.-Navy Anti-Submarine Warfare Innerspace Conference, Washington, D.C.

May 19–20: Southern Research Institute "Membrane Processes for Industry" Symposium, Birmingham, Ala.

May 21: Armed Forces Day.

May 31–June 2: American Society for Quality Control Meeting, New York City.

June 6–10: Society of Automotive Engineers Convention, Detroit, Mich.

June 7–9: Armed Forces Communications & Electronics Assn. Convention, Sheraton-Park Hotel, Washington, D.C.

June 12–15: American Society for Mechanical Engineers Meeting, Philadelphia, Pa.

June 19–23: Assn. of Industrial Advertisers Meeting, New York City.

MEETINGS AND SYMPOSIA

MAY

Symposium on Electrode Processes, May 1–6, in Cleveland, Ohio. Cosponsors: Air Force Office of Scientific Research and the Electrochemical Society, Inc. Contact: Lt. Col. M. D. Sprinkel (SRC), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., S. W., Washington, D. C. 20333, (Area Code 202) OXford 6-8706.

Bionics Symposium 1966, May 3–5, at Sheraton Hotel, Dayton, Ohio. Sponsors: Aerospace Medical Research Laboratory, Aerospace Medical Div.; and Avionics Laboratory, Air Force Research and Technology Div. Contact: Dr. H. L. Oeistreicher (MRBAM), Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio 45433. (Area Code 513) 253–7111, ext 36108.

Fifth Army Conference on Tropical Meteorology, May 5–6 or May 12–13, in Miami, Fla. Sponsor, U. S. Army Electronics Command. Contact. M. J. Lowenthal (AMSEL–BL–MA), Atmospheric Sciences Laboratory, Fort Monmouth, N.J. 07703, (Area Code 201) ext 61691.

Ninth Navy Science Symposium, May 5–6, at Departmental Auditorium, Constitution Ave. between 12th and 14th Streets NW, Washington, D. C. Sponsor: Office of Naval Research. Contact: Robert J. Mindak, Office of Naval Research (Code 104), Washington, D. C. 20360, (Area Code 202) OXford 6–4720.

Annual Conference on Photographic Science and Engineering, May 9–13, at San Francisco Hilton Hotel, San Francisco, Calif. Cosponsors: Atomic Energy Commission and Lawrence Radiation Laboratory. Contact: R. P. Michaelis, Lawrence Radiation Laboratory, Berkeley, Calif.

1966 National Aerospace Electronics (NAECON) Conference on Changing Theme in Aeronautics and New Look in Avionics, May 16–18, at Dayton-Sheraton Hotel, Dayton, Ohio. Sponsors: Institute of Electrical and Electronics Engineers, American Institute of Aeronautics & Astronautics and Institute of Navigation. Contact: Mrs. M. S. Roberts, NAECON, 1220 E. Third St., Dayton, Ohio.

JUNE

Electromagnetic Windows Symposium, June 1–3, at the Georgia Institute of Technology, Atlanta, Ga. Sponsor: Air Force Avionics Laboratory. Contact: R. Ireland (AVWE-3), Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio 45433, (Area Code 513) 253–7111, ext. 55720.

Fifth U. S. National Congress of Applied Mechanics, June 14–16, at the University of Minnesota, Minneapolis, Minn. Sponsors: Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, American Physical Society, American Society of Mechanical Engineers for Experimental Stress Analysis, American Society for Civil Engineers, American Institute of Aeronautics and Astronautics, American Mathematical Society, Society for Rheology and American Society for Testing and Materials. Contact: Maj. Lawrence P. Monahan, Jr., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, (Area Code 919) 286–2285.

International Conference on Crystal Growth, June 20–24, in Boston, Mass. Sponsor: Air Force Cambridge Research Laboratories. Contact: Charles S. Sahagian (CRWPC), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01731, (Area Code 617) CR 4–6100, ext. 3298.

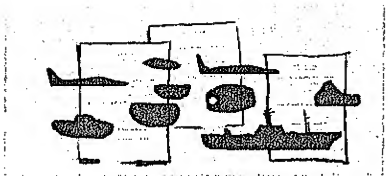
Low Speed Aerodynamic Problems Associated with Helicopters and V/STOL Aircraft, June 22–24, in Buffalo, N. Y. Co-sponsors: U. S. Army Aviation Materiel Laboratories and Cornell Aeroautical Laboratory, Inc. Contact: John E. Yeates, U. S. Army Aviation Materiel Laboratories, Fort Eustis, Va. 23604, (Area Code 703) 878–4101. (Rescheduled from March 30–April 1.)

Second Rochester Conference on Coherence and Quantum Optics, June 22–24, at University of Rochester, Rochester, N. Y. Co-sponsors: Air Force Office of Scientific Research and Air Force Cambridge Research Laboratories. Contact: Dr. M. C. Harrington (SRPP), Air Force Office of Scientific Research, Tempo D, 4th Street and Independence Avenue SW, Washington, D. C. 20333, (Area Code 202) OXford 6–4464.

Cold Spring Harbor Symposium on Quantitative Biology, dates undetermined, in Cold Spring Harbor, N. Y. Sponsors: Cold Spring Laboratory for Quantitative Biology, Air Force Office of Scientific Research, National Institutes of Health, National Science Foundation and Atomic Energy Commission. Contact: Dr. R. V. Brown (SRLA), Air Force Office of Scientific Research, Tempo D, 4th Street and Independence Avenue SW, Washington, D. C. 20333, (Area Code 202) OXford 6–4181.

JULY

Solid Propulsion Conference, week of July 18, in Washington, D. C. Co-sponsors: Interagency Chemical Rocket Propulsion Group and American Institute of Aeronautics and Astronautics. Contact: P. J. Martin, Chemical-Propulsion Information Agency, 8621 Georgia Ave., Silver Spring, Md. 20910, (Area Code 301) 589–7700, ext. 560.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during month of February 1966:

DEFENSE SUPPLY AGENCY

1—Bristol Mfg. Corp., Bristol, R.I. $1,047,253. 321,490 pairs of men's high rubber overshoes. Bristol. Defense Personnel Support Center, Philadelphia.

—J. P. Stevens, Inc., New York City. $2,034,000. 600,000 yards of tropical wool cloth. Rockingham, N.C. and Milledgeville, Ga. Defense Personnel Support Center, Philadelphia.

—J. P. Stevens, Inc., New York City. $1,245,000. 500,000 yards of polyester wool cloth. Greer and Wallace, S.C. Defense Personnel Support Center, Philadelphia.

—Pacific Mills Division of Burlington Industries, Halifax, Va. $3,829,075. 1,579,000 yards of polyester wool cloth. Halifax and Clarksville, Va., and Raeford, N.C. Defense Personnel Support Center, Philadelphia.

—J. P. Stevens, Inc., New York City. $2,529,000. 600,000 yards of wool serge cloth. Rockingham, N.C.; Greer, S.C.; and Milledgeville, Ga. Defense Personnel Support Center, Philadelphia.

—Pacific Mills Division of Burlington Industries, Inc., Halifax, Va. $1,640,000. 400,000 yards of wool serge cloth. Raeford, N.C. and Clarksville, Va. Defense Personnel Support Center, Philadelphia.

4—Enterprise Wire Co., Blue Island, Ill. $4,040,640. 368,000 coils of concertina barbed wire. Blue Island. Defense Construction Supply Center, Columbus, Ohio.

7—Burlington Industries, New York City. $1,422,500. 700,000 yards of tropical khaki worsted material. St. Pauls, Fayetteville and Greensboro, N.C. Defense Personnel Support Center, Philadelphia.

8—U.S. Steel Corp., Cincinnati, Ohio. $1,298,446. 108,690 spools of barbed wire. Donora, Pa.; Joliet, Ill.; Duluth, Minn.; Fairfield, Ala.; and Pittsburg, Calif. Defense Construction Supply Center, Columbus, Ohio.

—Doyle Shirt Mfg. Corp., New York City. $1,693,134. 611,240 men's cotton poplin shirts. Doyle, Tenn. Defense Personnel Support Center, Philadelphia.

—Putnam Mills Corp., New York City. $1,087,500. 250,000 yards of herringbone twill cloth. Atlanta, Ga. Defense Personnel Support Center, Philadelphia.

9—J. P. Stevens Co., New York City. $2,187,180. 522,000 yards of wool serge cloth. Rockingham, N.C.; Greer, S.C. and Milledgeville, Ga. Defense Personnel Support Center, Philadelphia.

—Deering Milliken, Inc., New York City. $1,388,000. 400,000 yards of tropical wool cloth. McCormick, Johnston and Pendleton, S.C. Defense Personnel Support Center, Philadelphia.

11—B. G. Colton Division of Raylon Fabrics, New York City. $3,154,800. 3,300,000 yards of cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Riegel Textile Corporation of New York City. $1,773,247. 1,900,000 yards of cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Burlington Industries, Cramerton Mills Division, New York City. $1,868,905. 2,150,000 yards of cloth. New York City. Defense Personnel Support Center, Philadelphia.

—J. P. Stevens, Inc., New York City. $1,514,787. 1,793,000 yards of cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Prestex, Inc., New York City. $1,948,654. 2,052,000 yards of cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Prestex, Inc., New York City. $1,783,465. 713,000 yards of cotton and nylon duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

14—Prestex, Inc., New York City. $1,216,000. 600,000 yards of cotton and nylon water repellent cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Raylon Fabrics, Inc., New York City. $2,484,000. 1,200,000 yards of cotton and nylon water repellent cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Putnam Mills Corp., New York City. $1,640,000. 800,000 yards of cotton and nylon water-repellent cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Choctaw Mfg. Co., Silas, Ala. $1,383,488. 647,040 pairs of men's white trousers. Silas. Defense Personnel Support Center, Philadelphia.

—Putnam Mills Corp., New York City. $1,699,950. 2,475,000 yards of wind-resistant cotton poplin cloth. New York City. Defense Personnel Support Center, Philadelphia.

15—Pembroke, Inc., Egg Harbor City, N.J. $1,224,000. 45,000 men's wool overcoats. Egg Harbor City. Defense Personnel Support Center, Philadelphia.

16—General Aniline & Film Corp., Binghamton, N.Y. $2,740,621. 165,838 packages of radiographic film. Binghamton. Defense Personnel Support Center, Philadelphia.

21—Pembroke, Inc., Egg Harbor City, N.J. $2,426,141. 89,691 men's wool jersey coats. Egg Harbor City. Defense Personnel Support Center, Philadelphia.

—Chicopee Mfg. Co., Division of Johnson & Johnson, New Brunswick, N.J. $1,580,150. 2,210,000 yards of non-metallic, plastic insect screening. New Brunswick. Defense Personnel Support Center, Philadelphia.

—Rodana Research Corp., Bethesda, Md. $1,123,624. 1,780,704 atropine automatic injectors. Bethesda. Defense Personnel Support Center, Philadelphia.

—Commonwealth Oil Refining Co., San Juan, Puerto Rico. $3,609,195. 43,500,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

23—Southern Athletic Co., Knoxville, Tenn. $1,680,462. 266,740 pairs of men's cotton, wind resistant trousers. Knoxville. Defense Personnel Support Center, Philadelphia.

24—Pepperell, Inc., New York City. $1,020,178. 1,251,349 yards of olive drab cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

25—Southern Petroleum Co., West Memphis Ark. $1,496,994. 4,011,400 gallons of soil stabilizer. West Memphis. Defense Personnel Support Center, Philadelphia.

28—Firestone Tire & Rubber Co., Akron, Ohio. $7,179,478. Nylon membrane for runway and taxiway surfacing. Akron. Defense Construction Supply Center, Columbus, Ohio.

ARMY

1—Guy H. James Co., Oklahoma City, Okla. $4,632,896. Construction work on the Pine Creek Dam and Reservoir, Oklahoma Project. Engineer Dist., Tulsa, Okla.

—Mason & Hanger, Silas Mason Co., New York City. $2,637,453. Detonators and 90mm cartridges. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Motors, GMC Truck & Coach Division, Pontiac, Mich. $1,794,027. Dump trucks. Pontiac. Army Tank Automotive Center, Warren, Mich.

—Kentucky Mfg. Co., Louisville, Ky. $2,540,079. 515 semi-trailers. Louisville. Army Tank Automotive Center, Warren, Mich.

—Holston Defense Corp., Division of Eastman Kodak Co., Kingsport, Tenn. $18,200,582. Ordnance items. Kingsport. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Hercules Powder Co., Wilmington, Del. $6,693,598. Miscellaneous propellants and explosives. Raeford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Lockley Machine Co., New Castle, Pa. $1,430,739. Demolition kits. New Castle. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Motors, Allison Div., Indianapolis. $2,285,050. Transmissions for various vehicles. Indianapolis. Army Tank Automotive Center, Warren, Mich.

—General Motors, Allison Div., Indianapolis. $6,610,330. Transmissions for various vehicles. Indianapolis. Army Tank Automotive Center, Warren, Mich.

—Medico Industries, Pittston, Pa. $3,65[illegible],000. Metal parts for ordnance components of the 2.75" rocket. Pittston. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Continental Motors Corp., Muskegon, Mich. $1,839,963. Engine assemblies and containers for the M88 recovery vehicle. Muskegon. Army Tank Automotive Center, Warren, Mich.

—Stewart Warner Corp., Lebanon, Ind. $1,541,808. 60mm projectiles. Lebanon. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Hanson Machinery Co., Tiffon, Ohio. $1,379,918. Truck mounted cranes. Tiffon. Army Mobility Equipment Center, St. Louis.

—International Harvester Co., Melrose Park, Ill. $1,597,358. 91 diesel engine driven loaders. Libertyville, Ill. Army Mobility Equipment Center, St. Louis.

—Goodyear Tire & Rubber Co., Akron, Ohio. $2,376,130. Track shoe assemblies and pads for the M108 and M109 combat vehicles. Muncie, Ind. Army Tank Automotive Center, Warren, Mich.

—Standard Products Co., Cleveland, Ohio. $2,482,738. Track shoe assemblies for the M108 and M109 combat vehicles. Port Clinton, Ohio. Army Tank Automotive Center, Warren, Mich.

—Fruehauf Corp., Fullerton, Calif. $3,52[illegible],512. 15-ton amphibious lighters. Fullerton. Army Mobility Equipment Center, St. Louis.

—General Time Corp., Stamford, Conn. $1,574,046. Ordnance items. Stamford, Conn. and Euclid, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Boeing Co., Morton, Pa. $1,303,476. Components for the CH-47 helicopter. Morton. Army Aviation Materiel Command. St. Louis.

3—MacDonald and Kruse, Inc., and Huntington Engineering & Construction Co., Montrose, Calif. $5,302,103. Work on Los Angeles County Drainage Area Project. Industry, Calif. Engineer Dist., Los Angeles.

—Canadian Commercial Corp., Ottawa, Canada. $1,820,000. Doppler navigation sets (AN/ASN-64) and components (AN/APN-168). Ottawa. Army Electronics Command, Fort Monmouth, N.J.

4—Dravo Corp., Pittsburgh, Pa. $13,187,82[illegible]. Work on Arkansas River and Tributaries, Arkansas and Oklahoma Project. Fort Smith, Ark. Engineer Dist., Los Angeles.

—Kaiser Jeep Corp., Toledo, Ohio. $1,287,83[illegible]. 5-ton trucks with government furnished engines. South Bend, Ind. Army Mobility Command, Warren, Mich.

—RCA, Camden, N.J. $1,208,400. Light weight portable radio sets and repair parts. Camden. Army Electronics Command, Fort Monmouth, N.J.

5—Philco Corp., Philadelphia. $10,000,000. Phase II of an Integrated Wide Band Communications System. Philadelphia. Army Electronics Command, Fort Monmouth, N.J.

—Page Communications Engineers, Inc., Washington, D.C. $20,000,000. Work on Phase II of an Integrated Wide Band Communications System. Washington, D.C. Army Electronics Command, Fort Monmouth, N.J.

7—ITT Corp., Nutley, N.J. $3,170,125. Repair parts for the radio network system, Tropospheric Army Communication System. Nutley. Army Electronics Command, Fort Monmouth, N.J.

—Fegles Construction Co., Minneapolis. $2,930,000. Construction of a contaminated waste red water disposal facility and erection of an administrative support facility at the Joliet Army Ammunition Plant, Joliet, Ill. Engineer Dist., Chicago.

8—Remington Arms Co., Bridgeport, Conn. $14,980,751. 5.56 and 7.62mm ammunition. Independence, Mo. Ammunition Procurement and Supply Agency, Joliet, Ill.

—Drillmation, Inc., Centerline, Mich. $1,657,113. Bolts for M2 carbines. Centerline. Springfield Armory, Mass.

9—Canadian Commercial Corp., Ottawa, Canada. $1,340,567. Radio Sets. Grandby, Quebec, Army Electronics Command, Philadelphia.

10—Fairchild Space and Defense Systems, division of Fairchild Camera and Instrument Corp., Syosset, N.Y. $1,512,116. Ordnance items. Syosset. Ammunition Procurement & Supply Agency, Joliet, Ill.

11—General Electric, Burlington, Vt. $4,268,000. Repair parts for M61A1 20mm guns and XM12 armament pods. Burlington. New York Procurement Detachment.

—Coath and Goss, Chicago. $1,928,872. Rehabilitation and modification of buildings for the Fifth Army Headquarters, Fort Sheridan, Ill. Engineer Dist., Chicago.

—Grumman Aircraft Engineering Corp., Beth Page, N.Y. $2,575,415. Modernization of OV-1C aircraft. Stuart, Fla. and Beth Page. Army Aviation Command, St. Louis.

14—Cadillac Gage Co., Warren, Mich. $1,126,266. Bolts for the M2 carbine. Warren. Springfield Armory, Springfield, Mass.

—RCA, Camden, N.J. $17,000,000. Classified electronics equipment. Camden. Army Electronics Command, Fort Monmouth, N.J.

—Cubic Corp., San Diego, Calif. $1,442,682. Two Sequential Collation of Range ground stations. San Diego. Engineer Research and Development Laboratories, Fort Belvoir, Va.

15—Firestone Tire & Rubber Co., Akron, Ohio. 4,869,341. Rubber track shoe assemblies (T107) for the M88 vehicle. Noblesville, Ind. Army Tank Automotive Center, Warren, Mich.

—Sperry Rand Corp., Bristol, Tenn. $1,422,552. Fuzes for the PERSHING weapons system. Bristol. Picatinny Arsenal, Dover, N.J.

—Hughes Aircraft, Fullerton, Calif. $5,888,450. Satellite communications terminals (AN/MSC-46) (MARK-1B) together with equipment compliance reports and system summaries. Fullerton. Army Electronics Command, Fort Monmouth, N.J.

—Olin Mathieson Chemical Corp., New York City. $7,316,900. Reactivation of production facilities for production of ordnance items and for operation and maintenance activities at Badger Army Ammunition Plant, Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Altech, Inc., Parkersburg, W. Va., $1,497,232. Tank and pump units. Elizabeth, W. Va. Army Mobility Equipment Center, St. Louis.

16—Kasler Corp. and Gordon H. Hall, Inc., San Bernardino, Calif. $2,570,790. Work on the San Gabriel River Channel Project. Bellflower, Calif. Engineer Dist., Los Angeles.

—Dow Chemical Corp., Madison, Ill. $1,704,281. Manufacture of airfield aluminum landing mats. Kansas City, Mo. and Madison. Army Aviation Command, St. Louis.

—Atlantic Research Corp., West Hanover, Mass. $3,000,000. A classified quantity of ordnance items. West Hanover. Picatinny Arsenal, Dover, N.J.

17—Western Contracting Corp., Sioux City, Iowa. $1,287,830. Work on the Chesapeake and Delaware River Canal Project. Between Chesapeake City and Welch Point, Md. Engineer Dist., Philadelphia.

—California Stevedore and Ballast Co., San Francisco. $26,448,133. Stevedoring and terminal services for the period of March 1, 1966 through Feb. 29, 1968. Oakland, Calif. Western Area Military Traffic Management Terminal Services, Oakland, Calif.

—Collins Radio Co., Richardson, Tex. $3,800,000. Radio sets (AN/ARC-54). Richardson. Army Electronics Command, Fort Monmouth, N.J.

—Matson Terminals, Inc., San Francisco. $14,868,416. Stevedoring and terminal services for the period of March 1, 1966 through Feb. 29, 1968. Oakland and Alameda, Calif. Western Area, Military Traffic Management Terminal Services, Oakland, Calif.

18—University of Illinois, Urbana, Ill. $1,200,000. An additional 12 months work on a scientific research program. Urbana. Army Electronics Command, Fort Monmouth, N.J.

—Electronics Modules Corp., Timonium, Md. $1,500,000. Classified electronic components. Timonium. Army Electronics Command, Fort Monmouth, N.J.

—Marvel Mfg. Co., Washington, D.C. $1,069,533. Various propeller and rotor blade balancing kits for fixed and rotary wing aircraft. Caldwell, N.J. Army Aviation Materiel Command, St. Louis.

—Standard Container, Inc., Montclair, N.J. $1,988,985. Boxes for packaging ordnance items. Homerville, Ga. Frankford Arsenal, Philadelphia.

—Magnavox Co., Urbana, Ill. $1,675,000. Maintenance items for radio sets (AN/VRC-12). Urbana. Army Electronics Command, Fort Monmouth, N.J.

—Remington Arms Co., Bridgeport, Conn. $4,904,984. Carton packed 5.6mm cartridges. Bridgeport. Frankford Arsenal, Philadelphia.

21—Sperry Rand Corp., New York City. $2,096,517. Loading, assembling and packing ordnance items. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.

—International Harvester Co., Washington, D.C. $1,862,030. Various types of tank trucks. Birmingham, Ala. Army Tank Automotive Center, Warren, Mich.

—Ford Motors, Dearborn, Mich. $1,068,690. Tank trucks of various types. Dearborn. Army Tank Automotive Center, Warren, Mich.

—A. O. Smith Corp., Chicago. $8,416,119. Ordnance items. Waco, Texas and Milwaukee, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Machlett Laboratories Corp., Springdale, Conn. $1,000,000. Classified amount of image intensifier assemblies. Springdale. Army Electronics Command, Fort Monmouth, N.J.

23—Chrysler Motors, Detroit. $2,782,813. Cargo pickup trucks. Warren, Mich. Army Tank Automotive Center, Warren, Mich.

—Ford Motors, Dearborn, Mich. $2,146,544. Cargo pick-up trucks. Dearborn. Army Tank Automotive Center, Warren, Mich.

—Olin Mathieson Chemical Corp., New York City. $2,104,040. Ordnance items. Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

24—Raytheon Co., Norwood, Mass. $3,950,005. Communications equipment. Norwood. Army Electronics Command, Philadelphia.

—General Motors, Detroit. $2,356,006. Diesel engines for the M548 vehicle. Detroit. Army Tank Automotive Center, Warren, Mich.

—American Machine & Foundry Co., Brooklyn, N.Y. $5,614,433. Ordnance items. Garden City, N.Y. and St. Paul, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Servel, Inc., Burgess Battery Co. Division, Freeport, Ill. $2,255,653. Batteries for portable radio sets. Freeport. Army Electronics Command, Fort Monmouth, N.J.

—ACF Industries, Inc., St. Louis. $1,078,650. Ordnance items. Olivette, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Dynamics, Rochester, N. Y. $1,800,000. Radio teletypewriter sets. Rochester. Army Electronics Command, Philadelphia.

25—Harvey Aluminum Sales, Inc., Torrance, Calif. $6,633,279. Loading, assembling, and packing of ordnance items. Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Holliday Construction Co., Greenville, Ga. $1,031,274. Work on the West Point Dam and Reservoir, Georgia and Alabama Project. West Point, Ga. Engineer Dist., Savannah, Ga.

—Western Electric Co., New York City. $2,240,000. Improved modification kits for the NIKE HERCULES weapon system. Burlington, N.C. Army Missile Command, Redstone Arsenal, Ala.

—American Machine & Foundry Co., Brooklyn, N.Y. $1,896,847. Fin assemblies for ordnance items. St. Paul, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—R. G. LeTourneau, Inc., Long View, Tex. $7,140,015. 750-pound bomb parts, fin assemblies and packing crates. Long View. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Maxson Electronic Corp., Great River, N. Y. $1,377,848. Components for 20mm cartridges. Macon, Ga. Frankford Arsenal, Philadelphia.

—Amron Corp., Waukesha, Wis. $1,110,518. 40mm cartridge cases and special tooling. Waukesha. Ammunition Procurement & Supply Agency, Joliet, Ill.

28—FMC Corp., New York City. $3,710,992. Classified ammunition. Newport, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Canadian Commercial Corp., Ottawa, Ontario, Canada. $2,708,151. Advance production engineering for the utility carrier (XM571) and related kits. Montreal, Quebec. Army Tank Automotive Center, Warren, Mich.

—General Electric, Utica, N.Y. $2,000,000. Classified electronic equipment. Utica. Army Electronics Command, Fort Monmouth, N.J.

—Specialty Electronics Development Corp., Glendale, N.Y. $2,036,713. Telephone sets. Southbridge, Mass. Army Electronics Command, Philadelphia.

—General Motors, Detroit. $1,132,600. M114 armored reconnaissance carrier engine and transmission assemblies. Flint, Mich. Army Tank Automotive Center, Warren, Mich.

—Eugene Luhr and Co., and Midwest Construction Co., Nebraska City, Neb. $1,156,957. Work on the Port Arthur Hurricane Flood Protection Project. Port Arthur, Tex. Engineer Dist., Galveston, Tex.

—Beech Aircraft Corp., Wichita, Kan. $1,809,850. Guided missile targets. Wichita. Army Missile Command, Huntsville, Ala.

NAVY

1—Beech Aircraft Corp., Wichita, Kan. $2,078,500. KD2B aerial targets. Wichita. Bureau of Naval Weapons.

—EDO Corp., College Point, N.Y. $1,071,888. Field change kits to improve the performance of sonar equipment used onboard submarines. College Point. Navy Supply Center, Norfolk, Va.

—Poloron Products, New Rochelle, N.Y. $1,563,835. Fin assemblies used with the MK 82 MOD 1 general purpose bomb. Scranton, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—P&H Construction Co., Evansville, Ind. $1,035,711. Construction of an industrial annex at Naval Avionics Facility, Indianapolis, Ind. Dir., Midwest Div., Bureau of Yards and Docks.

—Firestone Tire & Rubber Co., Akron, Ohio. $1,391,500. Rubber inflatable life rafts for use on MSTS vessels. Akron. Navy Aviation Supply Office, Philadelphia.

—Westinghouse Electric Corp., Baltimore, Md. $20,520,000. Classified development effort related to Fleet Ballistic Missile Weapon System. Baltimore. Special Project Office.

2—Southern Stevedoring Corp., Norfolk, Va. $2,175,628. Stevedoring services at the Naval Supply Center, Norfolk, Va. Naval Supply Center, Norfolk, Va.

3—Litton Systems, Inc., Woodland Hills, Calif. $7,691,939. Airborne navigation computer set components. Salt Lake City, Utah; Duluth, Minn. and Woodland Hills. Bureau of Naval Weapons.

—Westinghouse Electric, Baltimore, Md. $13,498,698. Airborne radar sets for the Air Force. Baltimore. Bureau of Naval Weapons.

—Vitro Corporation of America, Silver Spring, Md. $10,196,775. Engineering services for the TERRIER, TARTAR and TALOS missile systems. Silver Spring. Bureau of Naval Weapons.

4—Otis Elevator Co., Stamford, Conn. $3,543,900. Sheridan/Shillelagh weapon system trainers. Stamford. Naval Training Device Center, Port Washington, N.Y.

—Grumman Aircraft Engineering Corp., Bethpage, N.Y. $4,400,000. Support FY 66 procurement of A-6A aircraft. Bethpage. Bureau of Naval Weapons.

—Curtiss-Wright Corp., Wood-Ridge, N.J. $1,462,818. Engineering services for Navy and Air Force J-65 aircraft engines. Wood-Ridge. Bureau of Naval Weapons.

—Norair Engineering Corp., Washington, D.C. $1,578,000. Construction and installation of the chambers for the Deep Submergence Research Complex, Navy-Marine Engineering Laboratory, Annapolis, Md. Dir., Chesapeake Div., Bureau of Yards and Docks.

7—Admiral Corp., Chicago. $3,854,440. Components for the AN/ARC-5 radio set. Chicago. Navy Purchasing Office.

—Boeing Co., Morton, Pa. $5,393,920. Rotor blades for CH/UH-46A helicopters. Morton. Navy Aviation Supply Office, Philadelphia.

—Westinghouse Electric, Pittsburgh, Pa. $11,002,470. Design and furnish reactor plant components for nuclear powered ships. Pittsburgh. Bureau of Ships.

8—Columbia University, New York City. $1,650,000. Additional marine geophysics research. New York City, Bermuda, and Atlantic islands. Office of Naval Research, Washington, D.C.

—United Aircraft, East Hartford, Conn. $1,861,311. Spare parts for aircraft engines used in P-2V5 and T-2B aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

—Sperry Gyroscope Co., Great Neck, N.Y. $2,695,000. Engineering services for TERRIER missile fire control radar sets. Great Neck. Bureau of Naval Weapons.

—International Telephone & Telegraph Corp., Camden, Ark. $1,317,467. Portable transmitters-receivers and accessory kits. Camden. Bureau of Ships.

—Philadelphia Gear Corp., King of Prussia, Pa. $1,465,590. Elevation drive assemblies for the AN/SPG-55A/B radar and installation tools. King of Prussia. Navy Purchasing Office, Los Angeles.

—Garrett Corp., AiResearch Mfg. Co. div., Phoenix, Ariz. $1,699,852. Spare parts for gas turbines. Phoenix. Navy Aviation Supply Office, Philadelphia.

9—Boeing Co., Morton, Pa. $3,667,977. Spare parts for CH/UH-46 helicopters. Morton. Navy Aviation Supply Office, Philadelphia.

—United Aircraft, East Hartford, Conn. $2,589,805, $2,110,857. Miscellaneous spare parts for J75-P17/19/19W engines for F-105 and F-106 aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

10—Edo Corp., College Point, N.Y. $22,906,337. Sonar sets for installation in naval surface ships. College Point. Bureau of Ships.

—Curtiss-Wright Corp., Wood-Ridge, N.J. $1,090,057. Spare parts for jet engines used in A-4B/C and AF-1E aircraft. Wood-Ridge. Navy Aviation Supply Office, Philadelphia.

—Douglas Aircraft, Long Beach, Calif. $2,070,000. Bomb release systems for Navy aircraft. Torrance, Calif. Bureau of Naval Weapons.

11—Southern Extrusions Inc., Magnolia, Ark. $1,680,380. Aluminum matting extrusions. Magnolia. Naval Air Engineering Center, Philadelphia.

—May Aluminum Inc., El Campo, Tex. $2,370,050. Fabrication of aluminum matting extrusions. El Campo. Naval Air Engineering Center, Philadelphia.

—Washington Aluminum Co., Baltimore, Md. $1,183,850. Fabrication of airfield matting pallets and mat assemblies. Baltimore. Naval Air Engineering Center, Philadelphia.

—Aluminum Company of America, Pittsburgh, Pa. $1,813,955. Aluminum matting extrusions. Cressona, Pa. and Lafayette, Ind. Naval Air Engineering Center, Philadelphia.

—Ford Instrument Co., Long Island City, N.Y. $2,380,000. Installment funding for gun fire control systems. Long Island City. Bureau of Naval Weapons.

14—Louis Allis Co., Milwaukee, Wis. $1,313,520. Additional power supply units for surface ship sonar systems. Milwaukee. Bureau of Ships.

—Westinghouse Electric, Pittsburgh, Pa. $3,272,960. Design and furnish reactor plant components for nuclear powered ships. Pittsburgh. Bureau of Ships.

15—Grumman Aircraft Engineering Corp., Bethpage, N.Y. $13,600,896. Increase of long lead time effort in support of FY 66 procurement of A-6A aircraft. Bethpage. Bureau of Naval Weapons.

—Bendix Corp., North Hollywood, Calif. $1,045,628. Radar altimeter systems. North Hollywood. Bureau of Naval Weapons.

—Clevite Corp., Cleveland, Ohio. $2,900,000. Research & development on a guidance and homing control system adaptable to torpedoes. Cleveland. Bureau of Naval Weapons.

—Raytheon Co., Lexington, Mass. $1,200,000. Research & development work on TARTAR missile control radar sets. Wayland, Mass. Bureau of Naval Weapons.

—Western Electric Co., New York City. $5,724,474. Classified oceanographic research. Whippany, N.J. Navy Purchasing Office, Washington, D.C.

—American Mfg. Co., Fort Worth, Tex. $5,216,400. 500-pound bomb bodies. Fort Worth. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—American Construction Co., Washington, D.C. $2,844,000. Construction of a composite medical facility addition at Andrews AFB, Md. Dir., Chesapeake Div., Bureau of Yards and Docks.

16—Lockheed Missile and Space Co., Sunnyvale, Calif. $2,500,000. Classified work. Sunnyvale. Special Projects Office.

17—Simplex Wire & Cable Co., Newington, N.H. $3,840,500. 1,345 nautical miles of undersea cable. Newington. Navy Purchasing Office, Washington, D.C.

—Westinghouse Electric, Pittsburgh, Pa. $2,839,000. Designing and furnishing of reactor plant components for naval nuclear powered ships. Pittsburgh. Bureau of Ships.

—Farmer Tool and Supply Corp., Denver, Colo. $1,153,400. Wing and rolleron assemblies for SIDEWINDER missiles. Denver. Navy Propellant Plant, Indian Head, Md.

—Kelsey-Hayes Co., Philadelphia. $1,167,145. 2.75 rocket components. Philadelphia. Navy Ships Parts Control Center, Mechanicsburg, Pa.

18—Clevite Corp., Cleveland, Ohio. $9,262,133. Shipboard sonar systems, including repair parts and engineering services. Cleveland. Bureau of Ships.

21—United Aircraft Corp., Stratford, Conn. $2,494,514. Spare parts for CH-53A helicopters. Stratford. Navy Aviation Supply Office, Philadelphia.

—Astro-Science Corp., El Monte, Calif. $2,321,236. Recorder/reproducers (AN/A-2H-1V). El Monte. Naval Air Development Center, Johnsville, Pa.

—General Electric, Washington, D.C. $21,893,258. Main propulsion machinery for nuclear submarines. Lynn, Mass.; Fitchburg, Mass and Schenectady, N.Y. Bureau of Ships.

—FMC Corp., San Jose, Calif. $12,373,715. Detailed design, construction, test and evaluation of prototype assault amphibian personnel carriers (LVTPX). San Jose. Bureau of Ships.

—Bendix Corp., York, Pa. $2,108,974. Target detecting devices for TALOS missile systems. York. Navy Purchasing Office, Washington, D.C.

—Poloron Products, Inc., New Rochelle, N.Y. $1,037,905. Bomb fin assemblies. Scranton, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Hughes Aircraft, Culver City, Calif. $16,000,000. Additional funding for the PHOENIX missile system for FY 66. Culver City. Bureau of Naval Weapons.

—International Telephone and Telegraph Corp., Harrisburg, Pa. $1,561,198. Lead electrical wire for 2.75-inch rockets. Ducannon, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.

23—Hydromatics, Inc., Bloomfield, N.J. $1,365,080. Ball valve sets for POLARIS submarines. Bloomfield. Bureau of Ships.

—Sangamo Electric Co., Springfield, Ill. $2,503,218. Sonar sets. Springfield. Bureau of Ships.

24—Otis Elevator Co., Stamford, Conn. $3,194,559. Fire trainer units for the XM-35 (Sheridan Weapon System). Stamford. Naval Training Device Center, Port Washington, N.Y.

25—York Corp., York, Pa. $1,324,746. Centrifugal air-condition units for naval ships. York. Bureau of Ships.

—Bethlehem Steel Corp., San Francisco. $1,907,500. Completion of reactivation work on the Military Sea Transportation Service (MSTS) aircraft ferry USNS KULA GULF (T-AKV 8). San Francisco. Commander, MSTS, Pacific Area, Fort Mason, Calif.

AIR FORCE

1—Northrop Corp., Hawthorne, Calif. 21,805,000. F-5 aircraft for allied nations under the Military Assistance [illegible] gram. Hawthorne. Aeronautical [illegible] Div. (AFSC), Wright-Patterson [illegible] Ohio.

—Hughes Aircraft, Culver City, Calif. [illegible] 200,000. Missile launchers for [illegible] craft. Culver City. Aeronautical [illegible] Div. (AFSC), Wright-Patterson AFB [illegible]

—Sperry Rand Corp., Charlottesville [illegible] $5,595,960. Radar sets for [illegible] 130H and WC-135 aircraft. [illegible] Aeronautical Systems Div. [illegible] Wright-Patterson AFB, Ohio.

—Garrett Corp., Phoenix, Ariz. [illegible] Starter and valve assemblies [illegible] craft. Phoenix. Aeronautical [illegible] (AFSC), Wright Patterson AFB [illegible]

—Hughes Aircraft, Culver City [illegible] $2,600,000. Work on an air-to-surface [illegible] sile guidance program. Culver [illegible] tems Engineering Group, Research & Development Div. (AFSC), Wright-Patterson AFB, Ohio.

—AVCO Corp., Wilmington, Mass. [illegible] 000. Re-entry vehicle technology [illegible] ton. Ballistic Systems Div. [illegible] ton AFB, Calif.

2—Thiokol Chemical Corp., [illegible] 180,000. Research & development [illegible] I MINUTEMAN motors. [illegible] Utah. Ballistic Systems Div. [illegible] Norton AFB, Calif.

3—General Electric, West Lynn, Mass. [illegible] 782,675. $2,500,000. Production [illegible] aircraft engines and component [illegible] ment work. West Lynn. [illegible] Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Kollsman Instrument Corp., [illegible] $1,317,382. Spare parts for [illegible] surveying systems. Elmhurst [illegible] Robins Air Materiel Area (AFLC) [illegible] AFB, Ga.

—Olin Mathieson Chemical Corp. [illegible] City. $1,858,088. Rocket propellant [illegible] ville, Va. San Antonio Air Materiel [illegible] (AFLC), Kelly AFB, Tex.

—ITT Research Institute, Chicago [illegible] 000. Operation of an electromagnetic [illegible] analysis center for space [illegible] polis, Md. Electronic Systems Div. [illegible] L.G. Hanscom Field, Mass.

4—Consolidated Diesel Electric Co. [illegible] Conn. $2,922,159. Production of [illegible] power generators. Stockton, Calif. [illegible] mento Air Materiel Area (AFLC) [illegible] lan AFB, Calif.

—Aerojet General Corp., [illegible] $4,055,185. Advanced storable [illegible] pellant rocket engines. [illegible] Force Flight Test Center (AFSC) [illegible] AFB, Calif.

7—Boeing Co., Seattle, Wash. [illegible] Modernization of MINUTEMAN [illegible] Knob Noster, Mo. Ballistic Systems [illegible] (AFSC), Norton AFB, Calif.

8—Fairchild Hiller Corp., Hagerstown [illegible] $2,100,000. Modification of [illegible] Hagerstown. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—AVCO Corp., Wilmington, Mass. [illegible] 000. Design, development, [illegible] tion of ballistic penetration [illegible] Systems Div. (AFSC), Norton AFB [illegible]

—A. J. Industries, Inc., [illegible] $1,122,000. Production of [illegible] tanks for F-105 aircraft. [illegible] nautical Systems Div. (AFSC) [illegible] Patterson AFB, Ohio.

—Ling-Temco-Vought, Inc., [illegible] $2,103,500. Modification of [illegible] Greenville. Aeronautical Systems [illegible] (AFSC), Wright-Patterson AFB [illegible]

9—Hazeltine Corp., Little Neck, N.Y. [illegible] 834. Production of communication [illegible] ment. Little Neck. Warner-Robins Air Materiel Area (AFLC), Robins AFB [illegible]

—Stromberg Carlson Corp., [illegible] $1,300,100. Production and [illegible] telephone communications equipment [illegible] chester. Oklahoma City Air Materiel [illegible] (AFLC), Tinker AFB, Okla.

—Viewlex, Inc., Holbrook, N.Y. [illegible] Production of portable photographic [illegible] with related technical data and [illegible] Holbrook. Aeronautical Systems [illegible] (AFSC), Wright-Patterson AFB [illegible]

—General Dynamics, San Diego, Calif. [illegible] 032,000. Work on ATLAS [illegible] boosters. San Diego. Space Systems [illegible] (AFSC), Los Angeles.

General Dynamics, San Diego, Calif. $3,113,500. Modification services for 23 ATLAS missiles to be used in a re-entry vehicle development program. San Diego. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

10 **Lear Siegler, Inc., Grand Rapids, Mich.** $3,508,516. Production of aircraft bombing computers. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

11 **General Precision, Inc., Little Falls, N.J.** $1,180,000. Production of ground support equipment for the C-141 navigational computer. Little Falls. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Goodyear Tire & Rubber Co., Akron, Ohio. $1,920,606. Production of wheel and brake assemblies for F-4 aircraft. Akron. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Seattle, Wash. $3,420,200. Modification of K-135 aircraft. Seattle. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

14 **Curtiss Wright Corp., Wood-Ridge, N.J.** $0,000,000. Work on the development of a vectored thrust cruise aircraft engine. Wood-Ridge. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

15 **Aeronomic Corp., Clearwater, Fla.** $2,104,686. Production of aircraft altimeters. Clearwater. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Aircraft Armaments Inc., Cockeysville, Md. $1,424,540. Production of aircraft fault detection equipment. Cockeysville. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

16 **Lockheed Aircraft, Marietta, Ga.** $1,039,947. Spare parts for C-141 aircraft engines. Chula Vista, Calif. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

General Electric, West Lynn, Mass. $36,875,000. Production of aircraft engines for the T-38 and F-5 aircraft. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

17 **North American Aviation, Canoga Park, Calif.** $2,800,000. Jet engines thrust research. Canoga Park. Air Force Flight Test Center (AFSC), Edwards AFB, Calif.

Aerojet General Corp., Sacramento, Calif. $1,882,945. Production of GENIE rocket motors and related data. Sacramento. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

United Aircraft, Farmington, Conn. $1,298,215. Research, development and integration of weather observing and forecasting systems. Farmington. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

Douglas Aircraft, Tulsa, Okla. $6,119,074. Modification and maintenance of B-52 aircraft. Tulsa. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

18 **Sylvania Electric Products, Mountain View, Calif.** $1,500,000. Security sub-systems for MINUTEMAN wings II and III. Mountain View. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

General Dynamics, San Diego, Calif. $1,000,000. Modification of launch facilities for use in the advanced ballistic re-entry systems program. San Diego. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Lockheed Aircraft, Marietta, Ga. $10,000,000. Production of C-130 aircraft. Marietta. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

21 **General Electric, Philadelphia.** $2,100,000. Design, development, test and evaluation of the MARK 12 penetration aids system. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Kollsman Instrument Corp., Elmhurst, N.Y. $1,647,411. Spare parts for mapping and survey systems. Elmhurst. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

Honeywell, Inc., Hopkins, Minn. $1,247,[illegible]. Production of components for ordnance items. Hopkins. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

24 **Hycon Mfg. Co., Monrovia, Calif.** $1,[illegible]. High altitude aircraft cameras. Monrovia. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

25 **Douglas Aircraft, Santa Monica, Calif.** $5,[illegible]. Launch support services for various space programs. Vandenberg AFB, Calif. Space Systems Div. (AFSC), Los Angeles.

28 **Westinghouse Electric, Baltimore, Md.** $1,000,000. Design, fabrication and test of day-night television systems for sighting targets. Baltimore. Systems Engineering Group, Research and Technology Div. (AFSC), Wright-Patterson AFB, Ohio.

Conductron Corp., Ann Arbor, Mich. $1,330,878. Radar flight test program. Ann Arbor. Systems Engineering Group, Research and Technology Div. (AFSC), Wright-Patterson AFB, Ohio.

Classified Info in Press Does Not Mean Materials Is Unclassified

Occasionally, articles in newspapers or trade journals may appear to contain information which is classified. Sometimes these articles purport to be official statements by high-level officials. Other times they may be well conceived but unofficial analyses by technical writers and journalists.

Publication of information does not necessarily mean that it has been declassified. Any comment which appears to be based on official knowledge could compromise classified information.

Anyone finding in the public press, articles which have the appearance of containing classified information, is invited to submit the item to the nearest Army, Navy or Air Force office with which he does business.

The article itself cannot be classified but the transmittal discussing the situation should bear classification markings which show plainly that they are "tentative." The DOD classification guidance must be followed pending receipt of official word.

DOD policy calls for reviewing existing security classifications whenever possibly classified information relating to military matters is made public. This review embraces both the published and related information. The source must be identified or verified. If exposure of classified information has occurred, possible damage must be assessed and precautionary or corrective measures taken within official circles.

Procurement Catalogs Available to Industry

Catalogs containing forecasts of planned major procurements for a twelve-month period in the bearings, metals, fasteners and electrical wire and cable commodities have been published by the Defense Industrial Supply Center (DISC) in Philadelphia, Pa.

The catalogs will be published quarterly to include latest information and are available to interested industries and distributors. They are being published in accordance with the DISC policy of providing the industrial community with as much advanced information as possible for planning purposes. Forecasts are based on the latest available information at the time of publication and are subject to modification.

Copies of specific catalogs may be obtained by writing to the Directorate of Procurement and Production, Defense Industrial Supply Center, 700 Robbins Avenue, Philadelphia, Pa. 19111. The commodities of interest should be specified.

DISC is a field activity of the Defense Supply Agency and purchases industrial type items for the Armed Forces. These items include bearings, block and tackle, rigging and slings, rope, cable and fittings, hardware and abrasive, fasteners, metal bars, sheets and shapes, and electrical wire and cable.

Zero Defects Handbook Published by DOD

DOD Handbook 4155.12-H, "A Guide to Zero Defects," recently came off the press and is now being distributed throughout Government and industry.

The new publication provides guidance for planning, implementing and sustaining Zero Defects programs. It is available for purchase from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C., for 20 cents.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July-Dec. 1965	July-Dec. 1964
Procurement from All Firms	$15,128,683	$11,762,808
Procurement from Small Business Firms	3,182,265	2,462,213
Percent Small Business	21.0	20.9

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D. C. 20301

OFFICIAL BUSINESS

POSTAGE AND FEES PAID

NORAD Catalogues 1,000 Objects in Space

The U.S. meteorological satellite, Tiros OT–3, placed in orbit by a three-stage Delta vehicle from Cape Kennedy, Fla., Feb. 3, marked the first time 1,000 objects have been orbiting in space at one time

Shortly after the satellite was placed in orbit it was redesignated ESSA–1 by the National Aeronautics and Space Administration.

Designed primarily to provide continuous data for operational and research meteorological purposes, the satellite is the eleventh in the U.S. Tiros program.

Officials at North American Air Defense Command's (NORAD) Space Defense Center, the agency given the task of catalogueing all man-made objects in space, stated that of the 1,000 objects in space, 971 are orbiting the Earth while 29 are deep space probes.

It has been estimated that by 1970 there will be between 5,000 and 7,000 man-made objects in Earth orbit.

The Space Defense System includes a global network of radar, radio and optical sensors supplying NORAD with tracking information on all satellites while maintaining a complete information catalogue of space vehicles. It determines orbits of space objects, keeps a schedule of satellite positions and predicts future positions.

The Space Defense Center, operated by the Air Defense Command's First Aerospace Control Squadron, has catalogued a total of 1,982 objects, although only 1,000 are still in space. The others have either decayed or have been intentionally deorbited.

They include 209 orbiting payloads—162 belonging to the United States, 41 to Russia, 2 to France, 2 to the United Kingdom and 2 to Canada.

Space debris or junk—the rocket packages and other bits and pieces of vehicles that have come apart—constitute the remaining objects. All of these are catalogued by the Space Defense Center.

The NORAD satellite-tracking system is multi-Service, composed of Air Force, Army, Navy and Canadian Forces Air Defence Command sensors with civilian scientific agencies contributing data on a cooperative basis.

Through the Space Defense Center at Colorado Springs, NORAD exercises operational control of the two main military elements of the system—the Air Force Spacetrack and the Navy Space Surveillance System.

Overclassification of Documents Expensive And Wasteful

Overclassification of documents can be both expensive and wasteful as well as time consuming because of the extra care which must be taken in handling this kind of material.

To save dollars, contractors and agencies are urged to review classified papers in their custody frequently to determine if they are overclassified.

When possible, overclassified material should be downgraded or declassified. If the holder of overclassified material is not authorized to perform this action, it should be referred to the office of origin or to the contracting activity, with reasons and recommendations.

When classified documents are no longer needed — get rid of them. This can be done by returning them to the contracting agency, downgrading or declassifying when authority to do so exists, or destroying them. However, be sure they are disposed in an authorized manner.

Remember, also, when preparing a document that is based on a classified document, the paper doesn't have to be classified unless it actually contains classified information.

DEFENSE INDUSTRY BULLETIN

Volume 2 No 4 April 1966

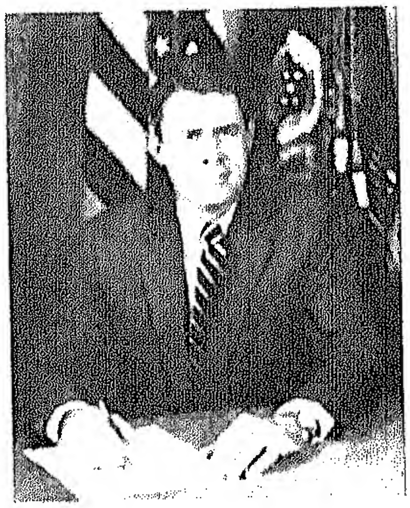
IN THIS ISSUE

DEPARTMENTS

DEPARTMENT OF DEFENSE

ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

DIAC Fills Important Advisory Role to DOD



Cyrus R. Vance
Deputy Secretary of Defense

Next month the Defense Industry Advisory Council will be four years old. The council was established to provide a forum in which Department of Defense logistics policies and practices can be discussed at top management levels. This objective is being met to the benefit of both the Government and industry.

With the continued support of public spirited executives, willing to serve on the council and its working groups, the DIAC can go on filling an important advisory role in the years ahead.

Cyrus R. Vance

(See related article on page 1.)

Defense Industry Advisory Council

by
Clyde Bothmer

The Defense Industry Advisory Council (DIAC) met on February 18 and 19 for the twelfth time since it was established by DOD Directive 5030.22, dated May 23, 1962.

It seems an appropriate time to take a brief look at the council's organization, membership and activities since the February meeting was the first for six new members as well as for its second Executive Secretary.

The six new members of the council are:

- Fred Borch, President and Chief Executive Officer, General Electric Co.
- Kermit Gordon, Vice President, The Brookings Institution.
- Daniel Haughton, President, Lockheed Aircraft Corp.
- Donald Holden, Chairman and President, Newport News Shipbuilding and Dry Dock Co.
- Roger Lewis, Chairman and President, General Dynamics Corp.
- Noel B. McLean, Chairman, Edo Corp.

The writer succeeded the first DIAC Executive Secretary, Samuel Crosby, in the fall of 1965 and, as previously noted, the February meeting was his first in this capacity.

Deputy Secretary of Defense Cyrus Vance is the Chairman of the Defense Industry Advisory Council. The Alternate Chairman is Assistant Secretary of Defense (Installations and Logistics) Paul Ignatius, and Dr. Ruben Mettler, President, TRW Systems, is Industry Vice Chairman.

Other industry members, in addition to the new members already listed, are:

- William Allen, President, The Boeing Co.
- George Brown, Chairman, Brown and Root, Inc.
- Carter Burgess, Chairman, American Machine and Foundry Co.
- Malcolm Ferguson, Chairman, Finance Committee, The Bendix Corp.
- Paul Gorman, President, Western Electric Co.
- E. V. Huggins, Consultant.
- Thomas Jones, Chairman, President and Chief Executive Officer, Northrop Corp.
- C. H. Kellstadt, Chairman, Board of Trustees, Logistics Management Institute.
- J. R. Kerr, President, Avco Corp.
- Jervis Langdon, Chairman and President, Chicago, Rock Island and Pacific Railroad.
- John Lawrence, Chairman and President, Dresser Industries.
- Thomas Nichols, Chairman, Executive Committee, Olin Mathieson Chemical Corp.
- Dr. Emanuel Piore, Vice President, IBM Corp.
- C. B. Thornton, Chairman and Chief Executive Officer, Litton Industries.
- Paul Wishart, Chairman, Finance Committee, Honeywell, Inc.

Council members are carefully selected for their ability to provide expert advice on a number of diverse subject areas and, hence, are chosen from a wide cross section of the private sector of the U. S. economy. Rotation of members approximately one-third every two years — helps further to broaden this experience base.

A word on the purposes of the council is probably useful since its role in advising the Department of Defense on logistics policy matters is not widely known. DOD Directive 5030.22 states that the mission of the council is to provide:

- The Secretary of Defense and his principal management assistants a forum for the presentation of logistics management objectives, problems and accomplishments to a representative cross section of defense industry.
- Representatives of defense industry a forum for discussing directly with the principal executives of the Department of Defense their suggestions and constructive criticisms of logistics management policies and practices from the viewpoint of their effect on defense industry.
- A focal point for the review and discussion of the findings of industry

Mr. Clyde Bothmer is Executive Secretary of the Defense Industry Advisory Council. Prior to this appointment, he was Director of Management for Manned Space Flight, National Aeronautics and Space Administration. He holds a B. A. degree in Political Science from the University of Iowa and a J. D. degree from that university's law school.

study groups which should be br
to the attention of the Secreta
Defense.

The council is organized and
tions in accordance with Exe
Order 11007 governing the form
and use of advisory committe
has met an average of three
each year generally in the s
fall and winter.

The first meeting of the c
was devoted primarily to a d
sion of organization and wo
procedures and the subject are
which the council might be of
benefit. Subsequent meetings
been concerned with many a
of Government-industry relation
As a result, workable answers
number of the problem areas
been found, and solutions for
are being sought.

A frequently asked question i
the council actually identifies
with which it should be concerne
how it conducts its work conc
those issues.

Topics or issues proposed fo
cussion with the council by the
are usually based on staff s
made within the Department.
cil members may propose and p
industry views based on studi
individuals, industrial associ
companies, or other groups alt
in deliberations on all issues,
understood that council member
resent no one but themselves.
an issue is fully identified, e
from the Department and indust
usually brought together in
porting group to advise on a so
These supporting groups are
ized as subcommittees (inv
members of the council) or
or working groups (normally
direct participation by council
bers). Except for certain sup
groups with long range advisa
signments, the groups go out
istence once the assigned ta
been completed. In order to
for a good working arrangeme
number of persons appointed t
of these supporting groups i
tively small.

Perhaps the best way to p
form the scope of the council
tivities is through an identifica
a few of the existing working
and subcommittees concentrat
current policy matters. These
working groups on the Con
Performance Evaluation (CPE
gram and the Contractor's W
Average Share in Risk (CWA
gram, as well as subcommitt
Contractors' Independent Te
Effort (CITE) and Effect of I
Procurement Policies on Profits
are 14 other supporting gro
DIAC now active and one ex
being formed to advise on
incident to the 'Total Packag
curement Concept.'[1]

Throughout its wide scope
terests, the council's activit
closely coordinated with those

[1] *"Total Package Concept," by*
Charles H. Terhune, Jr., USAF, De
dustry Bulletin, *Feb. 1966.*

The Phoenix Missile System: Preparing for Tomorrow, Today

by
Captain K. C. Childers, Jr. USN
Dep. Project Manager for Phoenix
F-111B/Phoenix Weapon System Project
Office of Chief of Naval Material

The air war being waged from Point Yankee and Point Dixie in the South China Sea has fully vindicated the Navy's furtherance, during the Cold War years, of the art and science of carrier warfare. Vietnam and the numerous other confrontations of recent years have served to underscore dramatically the fact that carrier-based aviation is firmly established as one of our country's principal means of flexible response. The current Federal budget submission, which contains requests for the personnel and "things" needed to expand this capability, stands as a carefully deliberated testimonial to the reliance that the Department of Defense places on naval aviation. These budget requests range from a new nuclear-powered carrier, plus both replacement and new model aircraft, down to the wide diversity of support equipment and the nuts and bolts needed to keep our carrier striking forces in top condition.

As an important ingredient in the credibility (and, frequently, the actuality) of the United States' military strength, each aircraft carrier represents an expensive, 20-years-plus capital investment. As one step toward the maximum return on this investment during the decade of the 1970's, the Navy in 1962 commenced development of the Phoenix missile system—a revolutionary concept that represents a significant technological advance in aerial warfare. The Phoenix development is a striking example of one of the ways the Navy is preparing for tomorrow's conflict today.

As an aggressive inroad into the realm of airborne intercept (AI) techniques, Phoenix stands in contrast to more conservative approaches that strive for only incremental improvements in the performance of existing systems. Although this latter course of action is a tempting alternative in the current limited war environment of relatively unsophisticated opposition, it does not provide for the enemy of the future who quite possibly may be both determined and sophisticated. With the Phoenix system we will have the capability to detect and track multiple air targets at extremely long ranges and then attack and kill at long range and on a priority, or degree of threat, basis—all in coordination with the Naval Tactical Data System (NTDS), the Airborne Tactical Data System (ATDS), and ship and shore based defenses. A capability of this magnitude will give our carrier forces in the 1970's the ability to project dominant air superiority over distant ocean and amphibious objective areas and, perhaps more importantly, insure through the long range of Phoenix missiles that our interceptors are not out ranged by enemy missiles. Mere knowledge of the presence of Phoenix should serve to deter.

As a weapon system concept Phoenix literally rose from the ashes of Navy aspirations in the late 1950's to combine the punch of a long range, sophisticated air-to-air missile with a subsonic aircraft launch platform, in an effort to extend the radius of protection derived from air-to-air weapons as far as practicable from task force centers. These aspirations took form as the Eagle/Missileer concept which postulated a subsonic launching platform in order to give the system the on-station (or loiter) time neces-

Capt. K. C. Childers, Jr., USN, is Dep. Project Manager for the Phoenix weapon system in the Office of Naval Material. He began his naval career as a carrier fighter pilot and has held several important assignments in the field of missile development. He was awarded the Legion of Merit for his work on Polaris and was Commander of the Naval Missile Center.

sary for maximum effectiveness rying the Phoenix system to sonic jet, such as the present A-6 Intruder, would begin to a imate the old Eagle/Missileer co However, in recent years, the v sweep wing of the aeronau daring F-111 has become a r thus, Phoenix is now under d ment as the armament system Navy's version of the F-111, 111B. The F-111B provides craft platform with an Eagl sileer type of loiter capability p added capability of sustained sonic flight.

The two basic elements Phoenix missile system ar AWG-9 Airborne Missile Contr tem (AMCS) and the AIM-54 sile. The AMCS consists of a doppler radar as its primary sensor, a parallel infrared (IR) sensor, a multi-purpose digita puter, and associated control a play subsystems. The pulse radar system represents the cu tion of years of development in mitter tubes, crystal filters and array antenna techniques all tial improvements in AI rada of the art before the long ran quirements of Phoenix could A low noise parametric ampl the receiver section contributes long range capability. Advanc pler techniques make look-dow acquisition possible. A flexib capacity computer permits sim ous track of a large number of and aids the missile control (MCO) in the assignment priorities and in missile firi AIM-54A missiles are availa quick reaction launch.

The IR target detector sy Phoenix complements the AI operation. In conjunction w radar, and slaved to it, the system has the angular resolu count the individual element raid that to the radar might as a single blip. Alternately, subsystem can contribute h tude surveillance when the r occupied with attacks at lo The sensor is especially against small, high-speed targ present a very small cross se the radar.

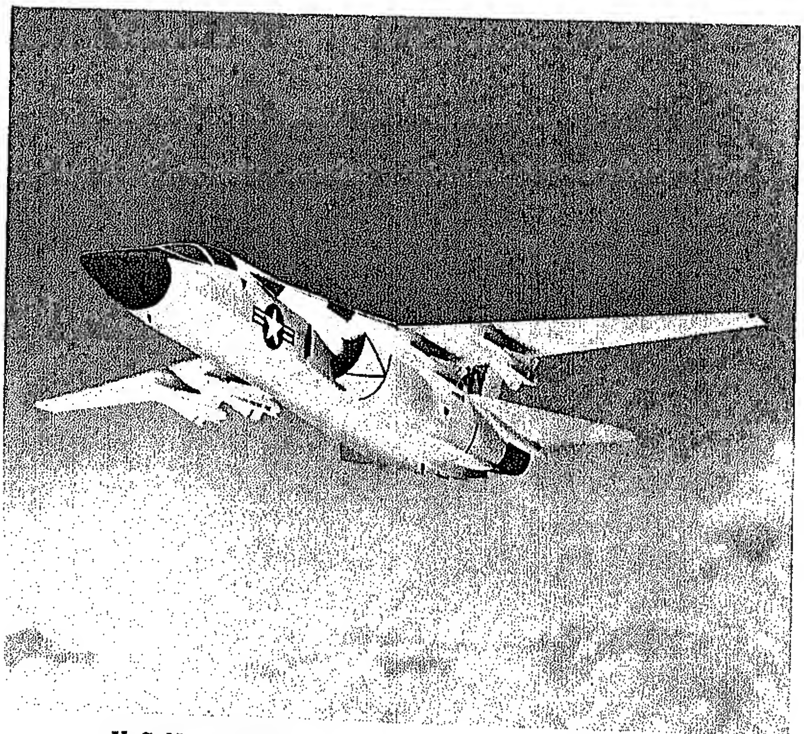
Data processing in the AMCS is performed in a gene pose digital computer that high speed operation and memory capacity in an extrem pact package. The compute track of targets detected by while the radar continues t Based on pre-programmed computer evaluates threats, p steering information for the paints a complete tactical situ the MCO by designating frie hostile targets in standard NT tology, all based on data either internally by Phoeni tained through external data

Another important function of the Phoenix computer system is for it to run a continuous confidence check on critical system parameters and to indicate tactics to be applied in degraded modes of operation. As a maintenance tool, the computer conducts self-test and fault-isolation routines on the whole Phoenix system in order to isolate faults to a specific, replaceable unit. This would be done when the F-111B is returning from a mission and is the key to the expected short turn-around time expected of the F-111B/Phoenix system on carrier decks. The Phoenix computer also can direct, as alternate modes, execution of any secondary missions assigned to the F-111B, such as, conventional ordnance delivery.

The Bureau of Naval Weapons is developing the Phoenix missile system through the combination of a coordinated program within its major field activities (see accompanying list) and a cost-plus-incentive-fee contract with the Hughes Aircraft Co. of Culver City, Calif. In general, the Bureau of Naval Weapons' field activities are responsible for ordnance component development and continuing test and evaluation responsibilities. Additional support is being rendered by other activities of the Naval Materiel Support Establishment. Hughes has prime contractor cognizance over total system development, which includes fabrication of the AIM-54A missile and the AMCS. The Rocketdyne Division of North American Aviation, Inc., is principal subcontractor for the solid propellant motor; UNIVAC and Control Data Corporation have competing designs for the central data processor. Several dozen other subcontractors of varying specialties contribute to the total Hughes effort. The Phoenix system benefits directly from the Hughes/Air Force-sponsored ASG-18/GAR-9 air defense missile system development.

Overall Navy control of the Phoenix development is proceeding under the relatively recent innovation of intensified project management emanating from an Office of Naval Material Project Management Office. In this case, it is the F-111B/Phoenix Weapon System Project with Rear Admiral W. E. Sweeney, USN, the designated project manager. Phoenix equipment will be furnished as Government Furnished Aviation Equipment to the F-111B aircraft, which is being developed by the General Dynamics Corp. under the direction of the Air Force Program Director, F-111 Systems Program Office (SPO), Major General J. L. Zoeckler, USAF. Admiral Sweeney serves as General Zoeckler's deputy for SPO operations at Wright-Patterson AFB, Ohio, in addition to his duties as a Navy project manager.

As a high priority, many-faceted project, the development of Phoenix reaches deep into the technology and strengths of a balanced industry/Navy team. Through the collective efforts and perseverance of hundreds of people in these organizations, the Phoenix missile system will meet its commitment to the Fleet.



U. S. Navy F-111B in flight armed with Phoenix missiles.

Participating Bureau of Naval Weapons Field Activities in Phoenix Missile System Development

Naval Air Development Center, Johnsville, Pa.
- Renders technical advisory services to the project office and is responsible for developing handling equipment.

Naval Missile Center, Point Mugu, Calif.
- Coordinates range support at the Pacific Missile Range and provides targets for contractor tests. Will conduct the Navy technical evaluation (NTE) of the system.

Naval Air Test Center, Patuxent River, Md.
- Coordinates Navy test efforts and will conduct tests that evaluate the AMCS.

Naval Weapons Laboratory, Dahlgren, Va.
- Responsible for safety studies and is developing the high explosive warhead and cartridges for the ejection launchers.

Naval Ordnance Laboratory, Corona, Calif.
- Responsible for developing the missile target detection device, the safe/arm device, tactical telemetry receiver and recorder.

Naval Ordnance Laboratory, White Oak, Md.
- Responsible for developing special ordnance eqipment.

Naval Air Engineering Center, Philadelphia, Pa.
- Determines ship compatibility requirements.

Naval Ordnance Test Station, China Lake, Calif.
- Conducts rocket motor sled tests and assists in defining bombing computer requirements.

Naval Ordnance Plant, Louisville, Ky.
- Is developing missile packaging.

Naval Propellant Plant, Indian Head, Md.
- Performs rocket motor propellant characterization tests.

An Analysis of Cost Information Reports

by
Chauncey H. Dean
Professor of Cost and Economic Analysis
Air Force Institute of Technology
Wright-Patterson AFB, Ohio

Students at the Air Force Institute of Technology have frequently asked about Cost Information Reports (CIR), the relationship of CIR to the Cost and Economic Information System (CEIS) and, in a broader sense, the need for DOD-wide integrated external information systems. These questions provided the motivation for this article, which is intended to focus attention on CIR.

There are five different reporting formats comprising CIR. Defense contractors would be responsible for preparing and submitting one or more of the reports in response to a contractual requirement. The managerial cost information to be presented in the reports would pertain primarily to contractual items procured by the Defense Department from defense contractors. These reports, then, could be classified as being a part of the external reporting system, as differentiated from the internal reporting systems within DOD.

While CIR is still in the talking phase, it appears to be in the final stages of discussion within DOD. To understand more fully why the Cost Information Reports will soon become a reporting requirement, it is helpful to analyze some of the significant events leading to CIR.

Events Leading to CIR.

Is CIR just another additional reporting requirement to be placed on defense contractors? What is being done by DOD to coordinate and control the quantity and type of information to be reported by defense contractors on contracts? To answer these questions and others, let's first examine the overall changes in the defense industry product and price environment and analyze their impact on management information requirements within DOD.

Much has been written about the significant changes during the past 25 years in the defense industry product environment. The advent of jet propulsion, electronic systems, ballistic missiles, satellites, space probes and spacecraft, all since the A-bomb was dropped on Hiroshima on Aug. 6, 1945, has focused attention on the dynamic technology in weaponry.

During this same period, the changes in the defense industry price environment have been revolutionary rather than evolutionary. From the high production volume, low unit cost structure experienced during World War II, the pricing environment in the 60's has changed to a low production volume, high unit cost structure. While the A-bomb was the first billion-dollar weapon, it is now common for a new major weapon or support system (when the expenditures for research, development, test and evaluation, acquisition of equipment and operations are all considered) to be in the multi-billion dollar class. The magnitude and trend of defense expenditures for research, development, test and evaluation, facilities and acquisition of capital equipment are displayed in Table 1.

The unparalleled changes in the defense industry product and price environment, the significant increases in the number of variables and alternatives to be considered in military decision making and the high level of defense expenditures — all happening within a comparative short time—sparked a tremendous increase in demand from DOD and defense industry management for both technical and financial information. Some have called it an information explosion.

It is generally understood that the management information explosion within the DOD and defense industry has not always been orderly and coordinated in such a way as to prevent serious duplications and omissions. Types of information needed for decision-making purposes have not always been collected in the right format and stored in data libraries. Also, information storage and retrieval systems have not always been responsive to management needs.

The expanded need for cost and related information pertaining to weapon systems and major items of equipment—all designed to aid decision makers in making complex capital acquisition decisions—resulted in each of the Military Services and Defense agencies establishing a wide range of different reporting requirements for defense contractors. Presumably, each new reporting requirement was established in response to the needs of particular management groups. However, understanding and using the data provided from the different information systems has become somewhat comparable to understanding and using several foreign languages. Moreover, defense contractors have had a very difficult task complying with the diffused reporting requirements. Consequently, it is difficult for defense industry management to train personnel and maintain accuracy in estimating and reporting.

Relationship of CIR to CEIS.

The aforementioned developments produced a need for analyzing the many existing external information systems and establishing DOD-wide integrated information systems. The long-range objective would be management information systems which are integrated through common language and which serve the needs of different levels of DOD and defense industry management. An important step in this direction occurred on July 7, 1964, when a DOD directive pertaining to CEIS, numbered 7041.1, was

Expenditures for Research, Development, Test & Evaluation, Military Construction and Procurement for Fiscal Years 1955–1964

(Millions of Dollars)

Fiscal Year	Research, Development, Test & Evaluation	Military Construction	Procurement	Total
'55	2,267	$1,715	$12,838	$16,820
'56	2,101	2,079	12,227	16,407
'57	2,406	1,968	13,488	17,862
'58	2,504	1,753	14,083	18,340
'59	2,866	1,948	14,409	19,223
'60	4,710	1,626	13,334	19,670
'61	6,131	1,605	13,095	20,831
'62	6,230	1,346	14,623	22,199
'63	6,375	1,143	16,659	24,177
'64	7,018	1,022	15,349	23,389

Table 1.

The Army's Senior Scientific Advisors

The Army Scientific Advisory Panel (ASAP) includes some of the nation's most distinguished civilian scientists, educators, industrialists, and engineers. These men are the senior scientific advisors to the Secretary of the Army. They provide counsel on R&D matters to the Chief of Staff, the Assistant Secretary of the Army (R&D) and the Chief of Research and Development. The panel maintains a small core (at present, 21 out of 25 authorized) of active members and a variable larger group of consultants (approximately 40). Both members and consultants are appointed for a two-year term. The Panel Secretariat is furnished by the Office of the Chief of Research and Development (OCRD) and is located in the Pentagon.

To keep abreast of the Army R&D program, members meet three times a year February, June and October. Members and consultants attend an annual meeting in June. On these occasions, activities of specific military installations are viewed and briefings on areas of particular interest are received.

This panel, established in November 1951 by the Secretary of the Army, was born in an atmosphere of radically accelerated R&D activities. Instead of coping with specific laboratory solutions, its members focus efforts on challenging the laboratory leaders to accelerate progress in new areas. It is hoped that this concept, as it appears to the Army R&D Program, can be directed toward both tactics and hardware, so that lead time can be reduced through proper training and improved development.

Although the panel's role in this partnership with the Army may not be well known, its influence is taking effect in numerous ways; a tropic test center in the Canal Zone, improvements to the White Sands Missile Range, an Officer Evaluation Center in Alabama all result from specific recommendations by the Army's senior scientific advisors.

The ASAP comprises many talents. Currently the 21 members and 40 consultants represent 16 scientific disciplines; they are affiliated with 16 industries and with 22 colleges and universities. Industry heads, directors of research, university presidents and professors are included. This broad base of scientific and technological expertise provides both a resource of specialists and a detached outlook which the Army needs to help solve its R&D problems.

The present Chairman of the panel is Dr. Harold M. Agnew, Leader of the Weapons Division, Los Alamos Scientific Laboratory. He was a physicist with the Manhattan Project from 1942-1946 and Scientific Advisor, Supreme Allied Command, Europe, prior to assuming his present position at Los Alamos.

ASAP Vice Chairman is Dean Ralph E. Fadum, Dean of the School of Engineering, North Carolina State University at Raleigh. Dean Fadum was appointed to the panel in 1959 and assumed his present duties on January 5, 1966.

Since 1951 when it had only 10 members, the panel has undergone several reorganizations seeking to achieve responsiveness to the Army's needs. The panel was not established to act as a body or single committee. Initially, subpanels were created for the following functional areas:

- Air Mobility.
- CBR Warfare.
- Communications & Electronics.
- Ground Mobility.
- Firepower.
- Human Factors.
- Operations Research.
- Management of R&D.

Later, in the interest of flexibility, ad hoc groups replaced the permanent subpanel system. At the same time that permanent subpanels were discontinued, it was decided to bring the panel closer to similar special advisory groups which were serving the major commodity commands of the U.S. Army Materiel Command and the Scientific Advisory Group of the Combat Developments Command. This was accomplished by including on the ASAP as permanent members the chairmen of these advisory groups. Thus, seven chairmen of speciality advisory elements were added to the membership of the ASAP.

Subjects for ad hoc group study are normally suggested by the Army Materiel Command (AMC), Combat Developments Command (CDC), or one of the divisions of OCRD. The Panel Executive Committee (composed of the Assistant Secretary of the Army (R&D); the Chief of Research and Development; Panel Chairman and Vice Chairman; Commanding General, AMC; Commanding General, CDC; and ASAP Executive Secretary) selects the chairman for an approved study who, in turn, picks the members of his ad hoc group. Upon completion of the study, the final report is forwarded to the Chief of Research and Development and Assistant Secretary of the Army (R&D) for action, as appropriate, on the report's specific recommendations.

Since 1963, 11 ad hoc groups have completed work in the following areas:

White Sands Missile Range.
Chairman: Dr. Charles C. Lauritsen, Professor Emeritus, California Institute of Technology.

Mobile Energy Depot Concepts.
Chairman: Dr. Harold C. Weber, Professor Emeritus, Massachusetts Institute of Technology, and Chief Scientific Advisor, U.S. Army.

In-House Laboratories.
Chairman: Dr. Hector R. Skifter, Deceased (late President, Airborne Instruments Laboratory).

Tactical Communications.
Chairman: Mr. Donald G. Fink,

(Continued inside back cover)

Dr. Harold M. Agnew
Chairman
Army Scientific Advisory Panel

Dean Ralph E. Fadum
Vice Chairman
Army Scientific Advisory Panel

Two-Step Formal Advertising—
A Case History

by

Arthur W. Doherty

With the announcement in the *Commerce Business Daily* of January 4, 1965, that the "Bureau of Naval Weapons is contemplating the procurement of guidance, control and airframe groups for the Talos (RIM-8E) Surface-to-Air Guided Missile on a multi-year contract basis," the Navy's Surface Missile Systems Project Office initiated its first major procurement by two-step formal advertising. Ten months later, the contract was awarded at a price which was $25,000,000 and 40 percent below the programmed estimates.

The Talos guided missile, with a range over 65 miles, provides Naval forces with a long-range, surface-to-air guided missile, anti-air warfare capability. In conjunction with manned interceptor aircraft, it is used to break up and disrupt the coordination of hostile aircraft attacks far from the fleet. Talos is 32 feet long and weighs 7,800 pounds at launch. Boosted by a solid fuel rocket, it is ram jet propelled with beam riding midcourse and semi-active radar homing guidance.

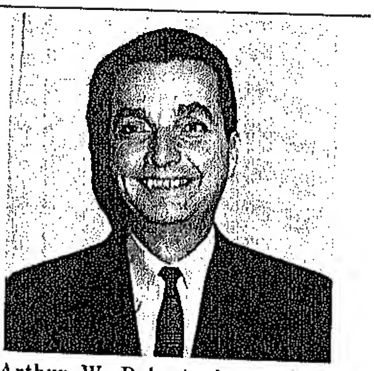
In December 1964, when the Fiscal Year 1966 budget was being finalized, the Department of Defense revised the Five Year Force Structure and Financial Plan to provide for the procurement of an additional 470 Talos (RIM-8E) missiles, and an Advance Procurement Planning (APP) Council was convened by the Surface Missile Systems Project Office (SMSPO) to determine the course of action. Advance Procurement Planning Councils implement Secretary of the Navy Instruction 4200.18A, which directs active support of Department of Defense procurement objectives, including weapons acquisition at the lowest overall cost commensurate with qualitative, quantitative and delivery requirements, and the promotion of full and free competition among interested qualified suppliers.

The RIM-8E version of the Talos guided missile had been procured in each of five previous fiscal years by directed, sole-source contracts. The APP Council determined that, under breakout and directed subcontract programs associated with these previous contracts, approximately 80 percent of the manufacturing documentation had already been used for competitive procurement by the prime contractor or by the Navy; and, further, that at least two different suppliers had used the documentation with satisfactory results. This documentation, then, was obviously suitable for competitive procurement; and it was believed that with adequate Government review, and revision where necessary, the balance of the documentation could be brought into condition for competition.

With assurance from the SMSPO that resources would be made available to perform a complete documentation review, the APP Council recommended that the proposed contract be awarded, on a multi-year contract basis, by competition among qualified suppliers. It was administratively determined, later, that two-step formal advertising would be the method of competition to be employed. The responsibility for conducting the competition was assigned to the U. S. Navy Purchasing Office (NPO), Washington, D. C., which had experience in conducting this type of procurement. The task of validating the bid documentation was given to the U. S. Naval Ship Missile Systems Engineering Station (NSMSES), Port Hueneme, Calif., which maintains the data repository for the SMSPO.

To assist NPO in conducting the two-step formally advertised procurement, the SMSPO established a Talos competition team of personnel from the Talos Project Office; the engineering, production and quality assurance areas of the Bureau of Naval Weapons; NSMSES; and others with responsibility for:

- Education of participants in two-step formal advertising.
- Definition of the article to be procured.
- Orientation of the potential bidders.
- Implementation of the competition.
- Administration of the resultant contract.



Arthur W. Doherty has served as Dep. Dir., TALOS Project, in the Navy's Surface Missile Systems Project Office since 1962. During World War II he served as a Naval aviator. After the war, Mr. Doherty joined the Navy's Bureau of Aeronautics, serving as Project Engineer in the Guided Missile Division until 1951. From 1951-1962, he was employed, in turn, by the Fairchild Corp. and Grumman Aircraft.

As indicated earlier, this was the first major SMSPO procurement to be awarded by two-step formal advertising. Many benefits were derived from the experience gained from a smaller two-step procurement previously conducted by the U. S. Navy Purchasing Office, Los Angeles, and NSMSES. Nevertheless, it was necessary to acquaint both Government and industry personnel with the differences between this method and the more widely understood methods, such as advertised procurement and negotiated competition, and with the advantages of the two-step method. To the Government, one advantage is that bids can be solicited on the basis of documentation which is suitable for use only by experienced producers while retaining the integrity of the formally advertised procurement process. Advantages to industry include the unequivocal establishment in step one of their qualification to bid; complete understanding of the task through preparation, evaluation and discussion of the technical proposal; competition with others of similar qualifications; and contract award based solely upon price in step two.

A basic requirement of advertised procurement, including two-step formal advertising, is that the Government must precisely define what is to be contracted for. In the case of the Talos competition, it quickly became apparent that the concern of the APP Council with documentation review was well founded and this effort occupied many people for many months. In addition to performing a detailed engineering review of 4,500 manufacturing drawings and 5,000 specification and process sheets, NSMSES responded to inquiries from potential bidders, revised over 600 drawings and specifications and prepared lists, indices and cross references to aid the bidders. The final bid package, which included much supplementary data on tooling and test equipment, consisted of 26,750 microfilm aperture cards. Twelve such packages were mailed to potential bidders. The potential bidders, of course, played a vital role in the documentation re-

view by pointing out errors, inconsistencies and the need for clarification.

The orientation of potential bidders, again, benefited both Government and industry. The Talos program, with roots going back to 1948, is one of the oldest guided missile programs in the country, but it was relatively little known. The Talos competition team, accordingly, publicized the competition to some extent to bring it to the attention of potential bidders. At the same time it was recognized that the preparation of bids on an item as complex as the Talos missile would be a costly procedure for industry and that the Navy had a responsibility to provide potential bidders with the maximum amount of information upon which they could base their business decisions whether to incur the considerable expense of preparing bids. To this end, not only was the data package made as complete and as accurate as possible, but an elaborate bidders' conference was held and the potential bidders were encouraged to visit the Government-owned facility in which the Talos missile was then being produced.

The bidders' conference was held at the U. S. Naval Weapons Station, Seal Beach, Calif. Project personnel described the complete Talos weapon system and the relation of the missile to the system, reviewed the missile subsystems and critical components in detail, and ventured an appraisal of the future of the project. Station personnel exhibited disassembled missiles and demonstrated missile checkout procedures. The inspection of the U. S. Naval Weapons Industrial Reserve Plant, Mishawaka, Ind., was conducted on a weekend in order to not disrupt production. Personnel of the office of the Bureau of Naval Weapons Representative, Mishawaka, explained manufacturing and assembly operations, quality assurance procedures and the utilization of the factory test and checkout equipment.

The final action to ensure complete industry understanding of the competition and proposed contract requirements was the detailed review with each bidder of the technical proposal he had submitted as required in the first step of a two-step procurement. All of the technical proposals were modified as a result of this review.

As industry became more and more familiar with the proposed task, a self-elimination process took place as evidenced by the following:

- Responses to January synopsis: 35.
- Responses to March synopsis: 23.
- Preliminary data packages mailed: 18.
- Attendees at bidders' conference: 21.
- Attendees at plant tour: 12.
- Final data packages mailed: 12.
- Technical proposals received: 5.
- Bids received: 5.

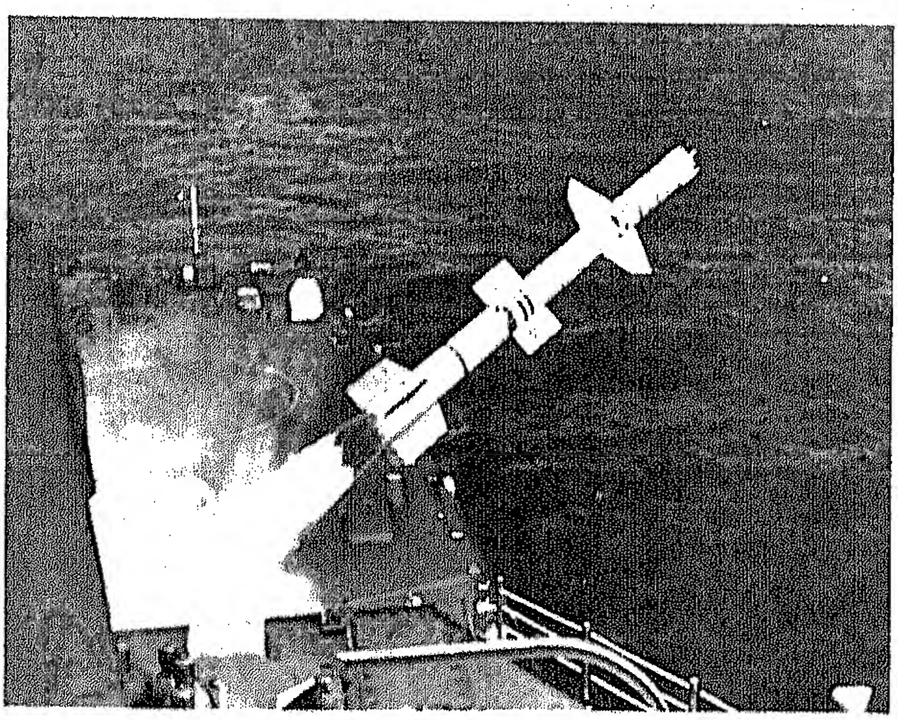
The attrition, actually, was not quite as great as indicated since two bidding teams were formed during the course of the competition and eight companies were represented in the final bidding.

The consensus of Government and industry personnel is that the Talos competitive procurement was highly successful and indicative of what can be accomplished in this area of procurement. The key to the success was the SMSPO Talos competition team, which was established to assist the Navy Purchasing Office in conducting the competition. The team was exceptionally well qualified for this pioneering effort including, as it did, personnel with experience in engineering, production, quality assurance, documentation, procurement and contract administration in both Government and industry, as well as specific experience in the Talos project. The team was also strongly motivated to prove that two-step formal advertising could be used for the procurement of as complex an item as the Talos guided missile in view of the widespread skepticism in both Government and industry. The fact that the team and bidder personnel, jointly, were able to establish the base for an equitable competition is demonstrated by the closeness of the bids and the fact that the two lowest bids were within $600 of each other.

The Talos competitive procurement again demonstrated that substantial price benefits can accrue from competition and established that two-step formal advertising can be used to obtain competition in the procurement of complex items. It also highlighted several requisites for successful competition:

- Precise definitions of all aspects at an early stage of the competition. This includes not only the documentation describing the article to be procured, but also the rules of the competition, the technical proposal requirements and evaluation criteria, and the terms and conditions of the bidding and resultant contract. Failure to meet all parts of this requirement resulted in unnecessary delays during the Talos competition.
- Provision of an experienced team in support of the Purchasing Office with authority to give it binding and unequivocal decisions as required.
- Provision of the maximum amount of useful data to potential bidders on an early and continuing basis and cooperation on the part of industry in analyzing and criticizing the data to the end that there may be a complete understanding between the buyer and the potential sellers at the end of step one as to what is being bid on in step two.

With the experience of success in two-step formal advertising behind it, the Surface Missile Systems Project Office may be expected to continue, and expand, its utilization of this method of procurement.



Talos Missile.

DEPARTMENT OF DEFENSE

Dr. Donald M. MacArthur was sworn in Feb. 21 as Dep. Dir., Defense Research & Engineering (Chemistry and Materials). Dr. MacArthur is the first to fill the newly created position and will be responsible for the technical review and evaluation of DOD research and development in the fields of chemistry and materials.

Maj. Gen. John T. Honeycutt, USA, has been named Commander of the Defense Atomic Support Agency's Field Command, Sandia Base, Albuquerque, N.M. He will succeed RAdm. Ralph C. Johnson, USN. The assignment became effective April 21.

Brig. Gen. John D. Hines, USA, has been reassigned as Commander of the Defense Industrial Supply Center, Philadelphia, a field activity of DSA.

Brig. Gen. John M. Kenderdine, USA, has been designated for assignment as Commander of the Defense Personnel Support Center, DSA, Philadelphia, upon the retirement of Maj. Gen. Oliver C. Harvey, USA, in July 1966. Gen. Kenderdine is now serving as Commander, Defense Industrial Supply Center, Philadelphia.

Roland L. Guyotte, Jr., has been appointed Executive Assistant and Senior Transportation Adviser to the Commander, Military Traffic Management and Terminal Service (MTMTS).

Col. Edward E. DuBose, Jr., USAF, has been reassigned as Chief, Data Systems Automation Office, Defense Construction Supply Center, DSA, Columbus, Ohio.

Col. William A. Fickling, USAF, has been made Chief of the Product Management Div., Defense Contract Administration Services, DSA.

DEPARTMENT OF THE ARMY

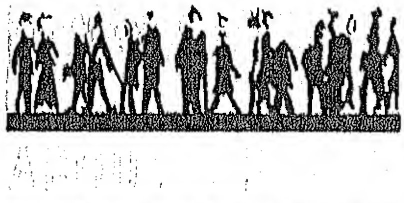
Maj. Gen. George T. Duncan has been named Dep. Commanding General, Third U. S. Army, Fort McPherson, Ga., succeeding Maj. Gen. William C. Bullock, who is retiring.

Brig. Gen. Julian J. Ewell succeeds Brig. Gen. George B. Pickett, Jr., as Chief of Staff, U. S. Army Combat Developments Command, Fort Belvoir, Va.

Brig. Gen. Leland G. Cagwin has been selected for promotion to major general and named Commander, U. S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md. Brig. Gen. John K. Boles, Jr., has been assigned as Dep. Commanding General of the Test and Evaluation Command.

Brig. Gen. Alvin E. Cowan, Dir. of Developments, Office of the Chief of Research and Development, has been reassigned to the Military Assistance Command, Vietnam, as Dir., Joint Research and Test Agency.

The new Asst. Dep. Chief of Staff, Logistics, for Materiel Readiness is Brig. Gen. Joseph M. Heiser, Jr.



Brig. Gen. Robert R. Williams succeeds Brig. Gen. George P. Seneff, Jr., as Dir. of Army Aviation, Office of the Asst. Chief of Staff for Force Development.

Brig. Gen. Stephen W. Downey, Jr., has been reassigned to the U. S. Army Combat Developments Command as Dir. of Doctrine.

Col. Philip E. Phaneuf has been named Commander of the Corps of Engineers Ballistic Missile Construction Office, Norton AFB, Calif. He replaces Col. Robert W. Love, who has become Missouri River Div. Engineer.

Winfred M. Crim, Jr., has been named chief of a newly established Research and Technology Dept. at the Nuclear Power Field Office, Fort Belvoir, Va.

DEPARTMENT OF THE NAVY

RAdm. Harry N. Wallin, will become Director of Facilities Engineering, Bureau of Yards and Docks, Washington, D.C. He relieves Capt. Paul E. Seufer, who will become Officer in Charge of Construction, Bureau of Yards and Docks, in Vietnam.

Capt. Edward G. Cummey has relieved Capt. Fred F. Kravath, as Director, Eastern Div., Bureau of Yards and Docks.

Capt. William R. Hoyer, relieved Capt. Greer A. Busbee, as Dir., Caribbean Div., Bureau of Yards and Docks, Jan. 24. Capt. Busbee has been transferred to Vietnam for duty with the Officer in Charge of Bureau of Yards and Docks Construction.

DEPARTMENT OF THE AIR FORCE

The following Air Force officers have been nominated for promotion to major general: Brig. Gen. John L. McCoy, Dep. Commander for Minuteman, Ballistic Systems Div., AFSC, Norton AFB, Calif.; Brig. Gen. Harry L. Evans, Vice Dir., MOL Program, Office of the Secretary of the Air Force; Brig. Gen. Woodrow P. Swancutt, Dep. Dir., Operations for Forces, Office of Dep. Chief of Staff (Plans and Operations); Brig. Gen. Wendell E. Carter, Dep. Chief of Staff, Comptroller, AFSC; Brig. Gen. Jewell C. Maxwell, Dir., Supersonic Transport Program, FAA; Brig. Gen. Hugh B. Manson, Commander, Air Force Flight Test Center, AFSC, Edwards AFB, Calif.; Brig. Gen. Andrew J. Evans, Jr., Dir., Development, Office of Dep. Chief of Staff (Research and Development), Brig. Gen. Kenneth C. Dempster, Dep. Dir., Operational Requirements, Office of Dep. Chief of Staff (Research and Development); and Brig. Gen. James T. Stewart, Dir., Office of Space Systems, Office of the Secretary of the Air Force.

Selections for promotion to the grade of brigadier general are as follows: Col. Harold A. [illegible], Dir., Military Assistance, Office of Dep. Chief of Staff (Systems and Logistics); Col. Gustav E. Lundquist, Dep. Commander, Rome Air Development Center, AFSC, Griffiss AFB, N.Y.; Col. Harold C. Teubner, Asst. for Research and Development Planning, Office of Dep. Chief of Staff (Research and Development); Col. Harmon [illegible] Burns, Dir., Maintenance Engineering, Office of Dep. Chief of Staff (Systems and Logistics); Col. John H. Herring Jr., Dep. Dir., General Purpose and Airlift Studies, Office of Dep. Chief of Staff (Plans and Operations); Col. Kenneth W. Schultz, Dep. for Ballistic Missile Re-Entry Systems, Ballistic Systems Div., AFSC, Norton AFB, Calif.; Col. Louis L. Wilson, Jr., Chief, Strategic Div., Office of Dep. Chief of Staff (Research and Development); Col. James O. Lindberg, Dir., Materiel Management, Sacramento Air Materiel Area, AFLC, McClellan AFB, Calif.; Col. William C. Pratt, Dir., Data Automation, Office of the Comptroller of the Air Force; Col. Buddy R. Daughtrey, Exec. Asst. to the Secretary of the Air Force; Col. Albert J. Bowley, Exec. to the Vice Chief of Staff; and Col. Robert F. Lee, Dir., Procurement Policy, Office of Dep. Chief of Staff (Systems and Logistics).

Brig. Gen. Glenn A. Kent has been selected for promotion to major general and reassigned from duty as Dep. Dir. for Development Plans to Dep. for Research and Development Analysis, Office of Dep. Chief of Staff (Research and Development).

Brig. Gen. Henry B. Kucheman, Jr., became Dep. for Limited War at Aeronautical Systems Div., AFSC, Wright-Patterson AFB, Ohio, on Feb. 7.

The following are new assignments within the Air Force Systems Command. Col. Benjamin N. Bellis, System Program Director for the F-12/SR-71, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; Col. Roland L. Bell, System Program Dir., Secure Communications, Electronic Systems Div., L. G. Hanscom Field, Mass.; Col. Willard D. Helms, System Program Dir., Survivable Communications, Electronic Systems Div., L. G. Hanscom Field, Mass.; Col. Edwin W. Brown, Vice Commander, Arnold Engineering Development Center, Arnold AFS, Tenn.; and Col. Wilbur H. Edwards, Dir., Requirements, MOL, Space Systems Div., Los Angeles, Calif.

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DOD Instruction 5210.49, "Security Classification Guides for DOD Construction Projects," Jan 13, 1966. Provides general guidelines for preparing security classification guides for individual defense construction projects. It is not intended as an index for mechanical classification of information.

> DOD Directives and instructions may be obtained from:
> Publications Distribution Branch, Office of the Secretary of Defense
> Room 3B200, The Pentagon
> Washington, D. C. 20301

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> Each Defense Procurement Circular is designed to place new or changed policy or procedures in effect prior to publication of an Armed Service Procurement Regulation (ASPR) revision. ASPR subscribers will receive DPC's and ASPR revisions through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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> Government research and development reports are available to science and industry at price indicated from:
> Clearinghouse for Federal and Scientific Information
> Department of Commerce
> Springfield, Va. 22151
> Authorized DOD contractors and grantees may obtain these documents without charge from:
> Defense Documentation Center
> Cameron Station
> Alexandria, Va. 22314

fire control radar, fire control equipment, weapons direction equipment, switchboards, launchers and expendables.

- Ship mounted sonar: programing and control of system performance, technical characteristics and configuration.
- Air launched underwater weapons: torpedoes and mines under system control of ASC.
- Explosive safety.
- EOD, small arms, demolition, infantry equipment, harbor defense equipment, ship pyrotechnics.
- Seaborne targets.
- Special support equipment for above.
- Research and exploratory development of explosives.

In addition to improving the overall coordination of the Navy's support activities in the areas of material, medicine and personnel by assigning responsibilities for these total functions to the Chief of Naval Operations, it is expected that the new organization will accomplish the following purposes:

- Affirm and strengthen the systems management approach to weapons development and acquisition.
- Reinforce the management strength of the functional organizations under the Chief of Naval Material; achieve more balanced and efficient spans of control and give more emphasis to ordnance and electronics.
- Centralize and improve the coordination of research, development, test and evaluation (RDT&E) management.
- Place more emphasis on the logistic support and maintenance of weapon systems.
- Increase the efficiency and economy of the Navy's material organization by exploiting opportunities for consolidation of common services.

Navy Reorganization Briefings Set

The reorganization of the Naval Material Command will be explained to industry representatives at three briefings to be held in Long Beach, Calif. and Washington, D.C.

Vice Adm. I. J. Galantin, Chief of Naval Material, will be on hand at the meetings to explain the Navy USMC material program and introduce speakers who will outline the structure of the new Naval Material Command.

Briefings will be held as follows:

April 26: Navy/National Security Industrial Assn. Briefing, Departmental Auditorium, 12th and 14th Sts. NW on Constitution Ave., Washington, D.C.

May 2: American Ordnance Assn./Navy League Briefing, Statler-Hilton Hotel, Washington, D.C.

May 3: Navy/National Security Industrial Assn. Briefing, U. S. Naval Base, Long Beach, Calif.

Industry Cooperation Sought To Improve Effectiveness of DOD Education and Training

by
Thomas D. Morris
Asst. Secretary of Defense (Manpower)

The Department of Defense operates the world's largest education and training establishment spending over four billion dollars a year in this area. Although the Military Departments have been leaders in the use of various new instructional methods, the Department of Defense must constantly continue seeking ways to improve the quality and effectiveness of its education and training programs. We have learned through our experiences in the weapon system acquisition process that industry can play an important role through its application of advanced technologies and systems management concepts. We are now asking industry to explore the potential of applying these same capabilities to DOD's education and training areas.

To facilitate this endeavor DOD, with the participation of the Office of Education and in affiliation with the National Security Industrial Association, is planning a briefing conference on June 14-15 in the Washington, D.C., area. A major objective of the conference will be to make industry aware of the magnitudes and kinds of DOD training and education programs and the procedures by which policies in these areas are formulated. If the systems approach to training problems is to have a meaningful impact on the quality of training, the interrelationship between all phases from personnel procurement through training utilization and retention must be understood by those who would seek to solve particular problems.

During this conference, representatives from the Military Departments, the Office of the Secretary of Defense and the Office of Education will briefly describe areas of priority concern and particular training needs which industry might want to explore. These priority areas will range from the development of better management techniques of education, training, and directly related support activities to the feasibility of the application of new teaching devices and equipment such as computer-assisted instruction.

Over the last two or three years there has been increasing interest on the part of both Federal and state governments, as well as industry, to utilize the systems approach in seeking new, effective solutions to old public service problems, such as transportation, education, pollution and areas other than weapons procurement. The State of California has found that the same companies which put men into orbit can also determine effective means to prevent crime, abate pollution and design statewide transportation systems.

The experience of the Job Corps has shown that systems teams of defense-oriented companies can also apply their skills to managing and operating effective training centers. Although industry has always provided the majority of goods used in our support areas, the DOD is now encouraging industry to provide more efficient innovations in support areas. For example, four studies were recently completed by industry for the DOD on the feasibility of applying systems engineering and management concepts to the provision of health care for military personnel by a fixed medical facility which will incorporate the latest technological advances in medical science and engineering. Most of the companies who received contracts are already in the defense weapons business; their flexibility to meet the demands of a Defense budget whose composition is constantly shifting is encouraging. We feel that the same approach applied to improving the quality of health services for the military can also be applied to our education and training areas.

The purpose of the June conference will be to develop a rapport between industry and the DOD early in the planning stages of a concerted effort to improve the quality of one of our largest support areas. The merits of the DOD-industry partnership approach in our weapon system acquisition process is self-evident; a similar approach to the education and training support area offers extreme promise.

For further information and attendance applications contact:

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technology. For instance, our previous strategy of massive retaliation resulted in emphasis on the development of strategic delivery systems and led to the successive development of the B-47, B-52 and B-58 bombers. With advancing nuclear and missile technology, this was followed by the intensive development of operational ballistic missiles and the resulting mixed force of both manned and unmanned strategic weapon systems. At the same time, the mounting threat of nuclear aggression on the part of the Soviets necessitated the development of an extensive warning and defense system against hostile bombers and, subsequently, of the Ballistic Missile Early Warning System against a possible Soviet missile attack.

When we adopted our current strategy the Air Force placed increased emphasis on providing weapon systems that could be employed in actions at all levels, nuclear as well as conventional. In addition to strengthening the Air Force's general purpose forces, the manifold demands of our strategy also required increased attention to the airlift forces as well as to various support areas, such as command and control, communications, and others essential to combined air-ground operations in limited conflicts. This shift in emphasis, however, did not involve an impairment of our nuclear deterrent and general war strength, i.e., our capability to respond at the highest level of conflict. In fact, this capability has been steadily improved.

From what I have said so far, it should be evident that we can plan our major research and development objectives for as far into the future as we can anticipate the nature and scope of the threat or threats we may have to meet. This is not too difficult for the immediate future because we are fairly safe in projecting past and current international and technological trends some years ahead. But, needless to say, this projection becomes increasingly speculative as we delve deeper into the future, because of the unpredictable factors which I mentioned earlier.

Of course, we can anticipate with some degree of assurance that the overall communist threat to our security and world peace will persist for many years to come. We can also expect that any lesser threats that may arise, predictably or unpredictably, will be designed somehow to foster the avowed communist objective of achieving world domination by any means whatever.

But as far as military research and development are concerned, the only firm conclusion we can draw is that we must continue to strive for overall superiority in a technological war, the end of which is not in sight.

To meet this very broad demand, we should think in terms of near-term, mid-term and long range research and development objectives. This division is more or less arbitrary and is mainly an indication of the degree of flexibility we must maintain the further ahead we attempt to plan.

To illustrate this and the other points I have made, let me discuss briefly some current and projected research and development objectives pertaining to three major areas of the overall communist threat—the nuclear-strategic threat, the limited war threat and the space threat.

As I stated earlier, the prospects for the persistence and expansion of the nuclear-strategic threat compel us to take all steps necessary to insure the preservation of our nuclear superiority against any contingency and for an indefinite period. I might add that such superiority not only must serve to deter nuclear aggression; it must also give our statesmen freedom of action in dealing effectively with any conflict of lower intensity without undue risk of precipitating nuclear war.

With some 1,100 ICBM's and Polaris missiles, as well as almost 700 strategic bombers in our inventory, we do have unquestionable nuclear superiority today and for the immediate future. But as the communist nations keep striving for advances in their nuclear offensive and defensive capabilities, we could easily lose that superiority unless we can match, step by step, any technological progress they may make.

For instance, the Soviets are doubtless engaged in a major effort to create an effective defense system against our strategic missiles. It is, therefore, essential that we develop means for insuring warhead penetration to the target against any predictable missile defenses, such as batteries of anti-missile missiles. These means may include a variety of electronic and mechanical penetration aids, and decoys which would make defense against them not only very complicated but also extremely costly.

At the same time, we must endeavor to make continuing advances in our missile technology so as to keep up with any progress the communist nations might achieve. Despite the dramatic progress we have made in the accuracy, reliability, survivability and reaction capability of our missiles, I have little doubt that future generations of missiles will be as far advanced over the present one as this generation is over our first ballistic missiles.

There is, however, one factor we must take into account, and that is the possibility that a technological breakthrough may lead to a revolutionary principle of missile defense which would be virtually impenetrable to even the most advanced missiles. Should we be the first to develop such a system, our strategic posture would be strengthened immeasurably. But if the Soviets should surprise us with such a missile defense system, our deterrent could be seriously impaired, especially if that deterrent were based primarily or solely on strategic missiles.

This possibility, however remote it may seem today, is one compelling argument in favor of retaining a mixed force of missiles and bombers. In addition to the invaluable flexibility provided by such a mixed force, the bombers conceivably may have to serve as penetration aids for our missiles. But our present force of strategic bombers is rapidly becoming obsolete and, while we will be needing fewer bombers to complement our still growing missile inventory, these aircraft must be advanced enough to be able to operate in the more sophisticated environment of the future.

As Secretary McNamara announced recently, it is planned to replace earlier models of the B-52 with a version of the F-111 tactical fighter, to be known as the FB-111, which will be a dual-purpose strategic and tactical bomber. Current plans call for some 210 FB-111's to be operational by 1971 which will give us a sizable fleet of highly advanced and versatile bombers. For the future I believe that it is highly desirable to pursue the development of what is known as the Advanced Manned Strategic Aircraft (AMSA) with performance characteristics exceeding even those of the FB-111. An AMSA would incorporate every feature found desirable in long-range strategic operations, including large payload capacity. This payload could consist of nuclear weapons, missiles, conventional bombs, or any other type of munitions.

The large payload capacity of the long-range strategic bomber is proving most useful right now in Vietnam. A

number of B-52's, converted to carrying conventional munitions, are being employed for area-bombing of widespread enemy installations and troop concentrations in South Vietnam and for depriving the enemy of any sanctuary throughout the vast expanse of the jungle. The B-52's have been so successful in this role that they are now being modified to carry, in a single aircraft, over 100 500-pound bombs or equivalent combinations.

But just as we do not plan to eliminate the bomber from our strategic forces, we must anticipate that a Soviet bomber threat will continue to face us for some time to come, in addition to their missile threat. This means that we must continue to maintain our bomber warning system and manned interceptors which can cope with the threat.

We are flight-testing the prototype of a new interceptor now, the YF-12A. Equipped with an advanced fire control system and highly maneuverable air-to-air missile, it can engage targets flying at low or very high altitudes. Its high cruise speed and very long range would permit its rapid deployment to any threatened area in the world.

These few examples show that the nuclear-strategic threat entails a great diversity of tasks for Air Force research and development, with objectives ranging all the way from near-term to the indefinite future. The emphasis is more on near-term objectives in the next area I want to discuss, the limited-war threat.

Here, too, the trend of the threat is clearly established for years to come. But the ensuing research and development objectives are more immediate and better defined, both because of the acuteness of the threat and because of our actual experiences in local conflicts, especially in Vietnam. One of the most important lessons we have learned in the Vietnamese war is the demonstration that airpower has assumed a primary and expanding role in limited wars and anti-guerrilla warfare.

To understand the future significance of this lesson we must remember that the communists, deterred from waging general nuclear war, have been trying to achieve their global objectives by fomenting and supporting local conflicts, ranging from internal insurrection to open aggression. Our commitments as well as our own national interests have compellled us to participate in a considerable number of such conflicts during the past two decades.

There can be little doubt that the communists will continue to encourage and support local conflicts in widely separated parts of the world. We must, therefore, endeavor to deter armed aggression and limited wars by resorting to the same principle which has been successful in deterring nuclear aggression and general war, that is, a credible capability to make aggression at any level too costly to the responsible parties. The Air Force must contribute a major share to that overall capability, and increasingly so at the lower levels of conflict.

It is true that airpower has been used effectively in all the local conflicts in which we have been involved since the end of World War II. But the primary role of airpower in fighting limited wars has never before been demonstrated as dramatically as is now the case in Vietnam. The great effectiveness of our air operations in that war was impressed on me during my trip to Southeast Asia last October when I had the opportunity to visit a number of bases and talk to hundreds of men of all ranks. But it was readily apparent that this effectiveness was due primarily to the extraordinary ingenuity and resourcefulness of our men in making optimum use of the airplanes and equipment available to them.

It must be understood that we have to use aircraft which are in our present operational inventory and which are not necessarily designed for the kind of counterinsurgency warfare we are conducting in Vietnam. I do not mean to imply that most or much of the equipment available to us in Vietnam is obsolete or unsuitable. Nor do I propose that we should tailor a major portion of our aircraft inventory to fit the specific conditions and environment with which we have to cope in Vietnam today. We certainly cannot afford to become overequipped with such specialized aircraft, and we may not always enjoy the "permissive environment" in which we are now operating, that is, virtually unchallenged rule of the skies.

But I do feel that the lessons we have learned in Vietnam point up the need for providing the Air Force's general purpose forces with more advanced and suitable aircraft for their expanding role in limited conflicts. This need may well be met by several types of aircraft which are now in various stages of development or under consideration.

Proposed versions of a Light Armed Reconnaissance Aircraft would permit its use for strike and defense suppression missions as well as a most suitable aircraft for our Forward Air Controllers. As you may know, these men, even in their light observation planes, have established a remarkable record in Vietnam in spotting enemy attackers and directing South Vietnamese and American strike aircraft against them. The previously mentioned YF-12 would be invaluable under conditions where we do not enjoy sole possession of the sky and where our transports and helicopters would be subject to attack by enemy fighters.

Our airlift forces, which provide the mobility so vital to the management of crises as well as in the conduct of local wars, will be strengthened greatly by the recently operational C-141 transport and, later, by the huge C-5A which is now under development. The Air Force is also interested in several projects for the development of a V/STOL, that is, an aircraft that can take off and land vertically or in a very short space. Such an aircraft may prove very useful for assault airlift, in addition to other tactical missions.

I will not dwell on our extensive research and development efforts in the supporting areas, in equipment and in special munitions for conventional wars in this article. May it suffice to say that the future will find the Air Force ever better prepared and equipped in every respect to carry out its mission at any level of conflict.

And now a brief word about the space threat. It is still too early to speak about such a threat except in terms of potential. Nor can we foretell whether that threat would be posed by the Soviets alone, by the Red Chinese, or conceivably by some other nation which, in the course of time, may acquire an offensive space capability.

But, in the first place, our future security demands that we look far ahead with regard to any potential space threat. Secondly, history shows that military weapons and strategy tend to exploit every possible medium for offensive action, and we must assume that this might also be true for space. Our only alternative, therefore, is to learn as much as we can about the space medium so that, if and when a threat should begin to materialize, we have the

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JUNE 1966

SPEAKERS CALENDAR

OFFICE OF THE SECRETARY OF DEFENSE

Mr. William H. Petty, Dir., Defense Contract Audit Agency, at Los Angeles Chapter Meeting, California Society of Certified Public Accountants, Los Angeles, Calif., May 17.

Mr. Henry A. Wallace, Regional Manager, Los Angeles Region, Defense Contract Audit Agency, at Los Angeles Chapter Meeting, California Society of Certified Public Accountants, Los Angeles, Calif., May 17.

RAdm. Robert H. Northwood, USN, Commander, Defense Electronic Supply Center, Defense Supply Agency, Dayton, Ohio, at Armed Forces Day Luncheon, Youngstown, Ohio, May 19.

DEPARTMENT OF THE ARMY

Lt. Gen. William F. Cassidy, Chief of Engineers, at American Power Conference Luncheon, Chicago, Ill., April 27.

Gen. Frank S. Besson, Jr., Commanding General, Army Materiel Command, at Annual American Ordnance Assn. Meeting, Washington, D. C., May 5.

Hon. William M. Hawkins, Asst. Secretary of the Army (Research & Development), at DOD Industry Meeting, St. Louis, Mo., May 13.

Maj. Gen. Francis S. Greenlief, Dep. Chief, National Guard Bureau, Annual American Ordnance Assn. Meeting, Washington, D. C., May 5.

Maj. Gen. Roland H. Anderson, Commanding General, Army Weapons Command, at Annual American Ordnance Assn. Meeting, Washington, D. C., May 5.

Maj. Gen. Charles Billingslea, Dep. Commanding General, Army Combat Developments Command, at Annual American Ordnance Assn. Meeting, Washington, D. C., May 5.

Hon. Stanley R. Resor, Secretary of the Army, at Armed Forces Day Observance, New Orleans, La., May 18-19.

Lt Gen. L. J. Lincoln, Dep. Chief of Staff (Logistics), at Industrial College of the Armed Forces National Security Seminar, Pittsburg, Pa., May 19-20.

Gen. Harold K. Johnson, Chief of Staff, U. S. Army, at Armed Forces Day Observance, Fort Benning, Ga., May 19; Atlanta, Ga., May 19; St. Paul, Minn., May 21, and Kansas City, Mo., May 21.

DEPARTMENT OF THE NAVY

VAdm. I. J. Galantin, Chief of Naval Material, at Navy/National Security Industrial Assn. Briefing on Naval Material Command, Departmental Auditorium, Washington, D. C., April 26; at American Ordnance Assn./Navy League Briefing on Naval Material Command, Statler-Hilton Hotel, Washington, D. C., May 2; at Navy/National Security Industrial Assn. Briefing on Naval Material Command, U. S. Naval Base, Long Beach, Calif., May 3.

Hon. Paul H. Nitze, Secretary of the Navy, at Surgeon Generals Conference, Washington, D. C., April 27; at National Convention of the Navy League, Santa Monica, Calif., May 27.

Adm. David L. McDonald, Chief of Naval Operations, at Army War College, Carlisle Barracks, Pa., April 28; at Air War College, Montgomery, Ala., May 23.

Capt. George L. Street, Commander Submarine Group, Mare Island Naval Shipyard, at Armed Forces Day Observance, Detroit, Mich., May 17.

RAdm. H. J. Goldberg, Chief, Bureau of Supplies & Accounts, at National Defense Transportation Assn. Meeting, New Orleans, La., May 20.

RAdm. E. R. Zumwalt, Commander Cruiser-Destroyer Flotilla 7, at Armed Forces Day Luncheon, Fresno, Calif., May 20.

RAdm. E. J. Fahey, Chief, Bureau of Ships, at 20th Annual Naval Civilian Administration Assn. Conference, Washington, D. C., May 23.

DEPARTMENT OF THE AIR FORCE

Gen. J. P. McConnell, Chief of Staff, U. S. Air Force, at Council on Foreign Relations, New York City, April 28.

Maj. Gen. B. I. Funk, Commander, Space Systems Div. (AFSC), at American Society for Quality Control Meeting, Los Angeles, Calif., May 14; at Aero Club, Buffalo, N. Y., May 20.

Brig. Gen. G. J. McClearnon, Dir., Maintenance & Engineering (AFLC), at Aerospace Electronics Conference, Dayton, Ohio, May 17.

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff (Systems & Logistics), at American Institute of Industrial Engineers Meeting, San Francisco, Calif., May 26-27.

DOD, NASA Sign New Manned Space Flight Cooperation Agreement

The Department of Defense and the National Aeronautics and Space Administration have reached a new agreement for the coordination of their manned space flight programs.

The memorandum of understanding, signed by Defense Secretary Robert S. McNamara and NASA Administrator James E. Webb, supersedes the Jan. 21, 1963, agreement between the two agencies concerning the Gemini program and establishes a joint NASA-DOD Committee known as the Manned Space Flight Policy Committee.

Within guidance provided by the Secretary of Defense and the Administrator of NASA, the committee will determine top level policy concerning the Manned Space Flight Program, assure the coordinated planning of the agencies' programs in this area, and resolve matters concerning the mutual participation in and support of the Manned Space Flight Program which cannot be resolved at a lower level.

Co-Chairmen of the Committee are Robert C. Seamans, Jr., NASA Deputy Administrator, and Dr. John S. Foster, Jr., Director of Defense Research and Engineering.

Other members are: Daniel J. Fink, Deputy Director, Defense Research and Engineering (Strategic and Space Systems); Dr. Alexander H. Flax, Assistant Secretary of the Air Force (R&D); Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight; and Dr. Homer E. Newell, NASA Associate Administrator for Space Science and Application.

FROM THE SPEAKERS ROSTRUM

Address by the Honorable Robert N. Anthony, Asst. Secretary of Defense (Comptroller), at the DOD Advanced Planning Briefings for Industry, Boston, Mass., March 3, 1966.

Hon. Robert N. Anthony

Resource Management Systems

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First of all, what do we mean by Resource Management Systems? Nothing very exotic, nothing very mysterious. The word "resource" in this context means labor, materials and services. Looked at as resources, labor, materials and services can most easily be described and measured in dollar terms and, therefore, the common denominator used in our Resource Management Systems is usually monetary. In broadest terms, we mean by Resource Management Systems all the systems that aid DOD management in their task of assuring that resources are obtained and used both effectively and efficiently in the accomplishment of DOD objectives. That is a pretty theoretical definition. The term may become more meaningful if I list the principal types of systems that are included within it. These are:

- Programming and budgeting, which is the process of deciding on our goals and the resources we need to reach these goals, and of justifying these needs to the Congress.

- The management of resources for operating activities, that is the combat forces and the associated support and command establishment that make up the Department.

- The management of inventory and similar assets, which is the process of controlling the millions of items that flow through our supply system.

- The management of the acquisition, utilization and disposition of capital assets, which is the process of getting the weapon and support systems of the quality and configuration we need, on schedule, and at lowest cost.

Incidentally, I don't want to leave the impression that the systems do the managing of these functions. Quite the contrary. Managers—human beings—do the managing, of course, and the systems are no more than collections of procedures, forms and reports that help the managers do their job. Or, at least, they are intended to help managers do their job. For we must admit the possibility that a system may be nothing more than a paperwork exercise, that is, useful only in that it provides jobs for large numbers of clerks.

Let me now focus on the fourth item—the management of the weapon and support systems acquisition process. As I mentioned earlier, this is the realm of the relationship between you as developer and producer, and the DOD as customer, a relationship that may begin even before a contract has been signed, and that lasts through the completion of the contract. You can call this the DOD-contractor interface, and you can describe and deal with it in at least three different ways, depending on your point of view.

The project manager in the Defense Department sees it as the problem of extracting from contractors the information that he believes he needs to keep track of progress, and also the information he might possibly need to answer as yet undefined questions of program sponsors, budget analysts and his superiors. The project manager wants data tailor made to his individual specifications—general enough to be understandable, and detailed enough to keep him out of trouble when questions a asked by someone up the line. And, course, he wants the data to have t virtues of accuracy, timeliness, audi bility and zero cost. Simple enough a fair enough—from his point of view.

I don't need to tell this audience h the contractor sees the problem. might be an exaggeration to say that would prefer unlimited funding, an i definite amount of time and no stat reporting during the period between t signing of the contract and delivery product and bill. But not too much an exaggeration.

The top managers in DOD—the Se retary of Defense, his principal ass tants, the senior officials of the Milita Departments and Defense agencies have a different and perhaps broad concern. They must live with the o vious disparities between the points view of the Defense project manag and the contractor but, more impo tantly, they must represent the publ interest. No matter how good the co lateral for disengagement, the top ma agement of DOD is never relieved of i responsibility to guard national secu ity and be a wise steward of publ resources.

During the last decade, the Militar Departments have developed and pro duced a wide variety of weapon ar support systems, and they have also d signed a wide variety of manageme systems for dealing with these majo acquisitions. Each manager has sepa rately wrestled with the problem of d vising a system for describing plan for measuring and controlling progre against those plans, and for recordin experience so that the estimating an management job could be done bette the next time. The result has been proliferation of systems, reports an acronyms.

The names of these systems ar familiar to most of you: PERT Tim PERT Cost, Critical Path Metho PROMPT, IMIS, Line of Balanc Earned Value Reporting, PEMAR and CEIS—to name just a few.

Here again it will be helpful to d some classifying within this collectio of systems that we have labelled Acqui sition Information and Managemen

Systems. In one category are the procedures that have been developed to collect historical cost data, broken down in various ways, that help DOD people make better estimates and negotiate more knowledgeably, on the basis of experience. In a second category are all the various methods that have been developed by DOD project managers for measuring progress against development and production plans, usually in terms of cost, schedule and technical configuration and characteristics.

We will label the first group, Cost Information Reports, and the second, Performance Measurement Systems. In both these areas, growth has been prolific. Fertile imaginations and active ingenuity have produced many varieties of procedures and forms. Common sense suggests strongly that the Defense Department and industry would both benefit from a concerted effort to achieve balance, compatibility, simplicity, and an adequate measure of uniformity among the multitude of management systems and subsystems already in existence or under preparation within DOD. Such an effort is under way. It is governed by a few basic precepts that I should like to list for you:

- Standardize and control DOD data demands on contractors and in-house facilities. The intent, pure and simple, is to reduce markedly the volume, variety and number of management-type reports which DOD demands of you.

- Minimize pressures to change effective contractor management accounting systems, but insure that data are credible and timely.

- Recognize that needs for data differ at various management levels. In particular, limit the flow of data to top Defense management to that needed for the carrying out of top management responsibilities.

- Leave room for innovation and progress and, hence, minimize the mandatory features.

- Recognize the paramount interest of the first line manager, i.e., the project manager.

To focus this work of improving acquisition management systems, I have set up an office of Assets Management Systems. Currently this office has men who represent all major elements of the DOD. These men are hard at work to identify acquisition management data requirements at all levels, and to inventory and describe all existing information and management systems in order to determine areas of similarity and peculiarity among the respective Service efforts.

Now where do we stand with respect to the cost collection systems? An early effort at standardization was called CEIS (Cost and Economic Information System). The motivation to develop CEIS came from the recognition we in DOD had to have the raw material that would help us make valid, independent cost estimates on major weapon systems. CEIS moved through the development process for nearly two years. This deliberate rate of progress was attributable not to any decrease in the degree of urgency and certainly not to lack of effort on the part of the developers, but rather to successive discoveries concerning the nature of the problem. It was something akin to peeling an artichoke (or an onion). There was layer after layer beneath the surface.

Two years of development, review, comment and accommodation have changed the original creature, CEIS, to the point where we decided to recognize the metamorphosis with a new name, CIR (Cost Information Reports). And today, after two major industry reviews, CIR is well on the road to implementation.

As reported in the Jan. 1 issue of *Business Week*, representatives of industry were given an almost unprecedented opportunity to review preliminary drafts of CEIS and CIR and to recommend modifications. What is more important, most of the recommended modifications have been incorporated in the latest version of the system. We are grateful for them. They have made the CIR more workable for industry without sacrificing the data needed by Defense analysts. This dialogue has produced what we think is a workable, rather than an arbitrary or visionary, program.

Thus, what began as another independent approach to part of the acquisition process is evolving into a system which attempts to recognize all aspects of the problem, gives careful attention to balance and integration among all associated subsystems and eliminates duplication and overlaps.

I do not believe it is necessary to recite the history of the DOD attempts to grapple with the problem of estimating the cost of weapon and support systems. Two important realities dominate this problem. We must utilize the products of our nation's technological advancement; yet we are constrained by limited resources. These conditions impose not only the imperative to choose from among alternatives, but also the necessity to engage in tough-minded procurement. If we are to do our proper job in contract negotiation, we must have the capability to estimate costs independent of those proposed by our suppliers. I am not saying that our estimates will always be more accurate. I am saying that a cost estimate arrived at through the process of a dialogue between an informed seller and an informed buyer will be more mutually satisfactory than a cost estimate arrived at unilaterally by one party to the negotiation. We, too, have a Board of Directors—the Congress—whom we must be able to satisfy.

We propose to obtain this capability to derive independent cost estimates by aggregating the actual costs of weapon and support systems in useful arrays and then, following a variety of widely accepted statistical procedures, extrapolating from such a data bank the potential costs of follow-on systems. Incidentally, although some people argue that the differences between successive generations in weapon and support systems families make such an approach infeasible, the fact is that we already have enough experience to know that it will work.

CIR has had the advantage of intensive scrutiny by various representatives of industry. What began as a proposal to gather information on almost every type of large procurement in the most extensive detail and in a rigidly prescribed format has been significantly modified. It now applies only to aircraft, missile and space systems; requires detail at a high level of summarization; and, with the one exception of the work breakdown structure element called airframe, permits wide latitude in report composition. I might insert here that we in the Comptroller's office and the people in the Office of the Director of Defense Research and Engineering are working together to insure that the work breakdown structure means and looks the same for Cost Information Reporting as it does for Configuration Management.

Unless there are very special circumstances that make it imperative, CIR will not be applied retroactively. And what about subcontractors? In aircraft, missile and space programs certain major subcontractors will be re-

quired by DOD to submit their own, separate Cost Information Reports, either directly to DOD or via the prime contractor, depending on the agreement between the prime and the subcontractor. Generally these will be subcontractors in the over-$50 million category. Costs of all other subcontractors will be summarized by the prime, and no separate reporting will be required by DOD.

CIR is composed of five forms:

- A contract cost data report, summarizing total costs to date on a contract, by work breakdown structure element, will cover all activities included in a contract or proposal.
- A functional cost-hour report may be used to collect additional cost support for certain of these elements.
- A progress curve report, also optional and also employed selectively, will provide the unit or average unit cost (dollars and manhours) of the unit or lot accepted during the reporting period.
- A fiscal year data report, summarizing program estimates by fiscal year for relevant work breakdown structure elements may be requested.
- Similarly, a fiscal year functional cost-hour report may be required with separate reports prepared for recurring and nonrecurring costs.

CIR is currently being processed through the Bureau of the Budget. Where applicable, it replaces other forms such as the DCPR series and the DD 1177. The Military Departments are staffing for its implementation, and we expect that it will be in operation on selected new contracts before the end of June.

Four of the five reports mentioned above are both optional and selective. You may be dubious about our willingness to exercise such optionality or selectivity with restraint. In order to insure that this is in fact done, we are setting up a new mechanism that requires the data that a project manager proposes to collect be screened and approved in advance by a high level review group. Under this procedure, the cost data requirements to be incorporated within a given contract, or series of contracts, for a given weapon or support system will be submitted by the appropriate Military Department to the Office of the Secretary of Defense for review. During this review, the proposed cost data requirements will be examined for adherence to standards and appropriateness of degree of detail specified. Any additional or unique data requirements will have to be completely justified before approval will be granted. This procedure is designed as an insurance policy against undesirable proliferation. If successful, it may be extended to cover not only cost data, but other kinds of nontechnical data.

In recent years, representatives of industry have viewed with alarm what they believed to be a trend on the part of DOD toward a requirement for a single standard accounting system for industry. I can say categorically that we have no such intention. We believe it is far better to make full use of existing effective contractor management accounting systems, each designed to meet the contractor's own needs, then to dream up a standardized strait jacket that, however well intentioned, would probably meet no one's needs. There are many different ways of putting together effective management systems, and they need not be exactly similar.

There is, however, a need to define what we mean by effective management accounting. Here we are looking for three principal characteristics:

- Costs are charged as incurred; that is, when, and only when, work is performed. For example, a material cost is charged to an account not when a purchase order is cut, but when resources are actually applied.
- Every reasonable effort is made to segregate from a general overhead account those items that can be considered directly attributable overhead and is thus directly chargeable.
- The system is completely auditable from the entry on the report directly back to the accounting system.

The detail needed by the project manager is obviously not required at the OSD level. The forms will permit progressively higher summarizations of data. The principal vehicle for this will be an integrated work breakdown structure. The idea of focussing managerial attention to component elements of a weapon or support system has been with us for some time. A specific work breakdown structure for a family of weapon systems is still subject to problems of definition, but it is understood well enough by most participants in the weapons acquisition process to permit its general application in management control. What is important is that now all components of DOD will employ a similar approach to the creation of work breakdown structures. The existence of such a structure, which is simply a hierarchy or pyramid of the elements which make up a weapon or support system, will allow the assembly of data at any level of detail desired. It will be the framework upon which the management information will hang.

Secretary McNamara often recalls the two general instructions given him by President Kennedy in January, 1961. These were in essence:

- Develop the military force structure necessary to support our policy.
- Procure and operate this force at the lowest possible cost.

These twin mandates still stand and demand that we exercise a degree of management attention which does not exist in other parts of the market place. We simply assert that this dual responsibility can best be satisfied when DOD and industry work together in understanding. I think a good example of how such cooperation can work in practice is to be found in the evolution of CIR.

Finally, some words about the work we are doing, in cooperation with the staff of the Assistant Secretary of Defense (Installations and Logistics), to simplify and standardize performance measurement systems which DOD project managers impose on contractors and in-house activities alike. One survey that I looked at recently found 58 or more different (or at least differently named) systems in use where there was an interface of DOD project managers and weapon system contractors. That's too many. Stating and agreeing on plans for phased progress of development and production, in terms of milestones, dollars and technical accomplishment, and then measuring progress against such plans just cannot be such a variable task that 58 or more procedures, reports and information systems are needed for it. Right now we are listing and analyzing these numerous systems, and hope very soon to find in them the useful least common denominator which will meet the needs of DOD management as a whole. Having done this, we hope to develop standard contractual language on performance measurement which does not specify procedural detail, but does spell out criteria and general characteristics.

Without changing effective management control systems used by contractors in running their business, we want simply to spell out the characteristics of a data converter which will make

the track from performance to summary reports both reliable and useful. You will hear more about our work in this field of performance measurement systems as this year goes on. Among other things, we expect to relate this performance measurement effort to Contractor Performance Evaluation in a meaningful way. The target for completing the performance measurement effort is December of this year.

I have thus attempted to explain the particular and peculiar requirements of the DOD which make necessary the creation and imposition of broad management systems. Systems such as I have described potentially affect all of you, and the question can legitimately be asked—what's in it for me?

All industry, but most particularly, small and medium-sized business, should benefit from the consolidation of many diverse performance measurement systems into a single coordinated approach.

The cost data banks, from which certain kinds of non-proprietary data will eventually be made available to industry, should provide a rich source of information.

The practice of close coordination with industry during systems development, and the policy of providing reasonably lengthy periods for industry review will be continued, and should produce workable results.

The policy of utilizing, rather than changing, effective industrial accounting systems should reduce any fears that the DOD will ultimately insist upon a standard accounting system.

Finally, the institution of the data plan review process at the OSD level should go a long way toward preventing the imposition of excessive or inappropriate data requirements on contractors.

While the DOD maintains its need to know and to manage, it continually attempts to recognize and alleviate the problems of industry.

A great deal of thought and effort is being devoted to the development of these systems, to make them responsive and useful, but not uselessly burdensome.

In this continuing effort to manage the interface between Government and industry, all of us as citizens need the benefit of all the accumulated wisdom and experience of both sides. We need from industry not only response and reaction, but affirmation and constructive ingenuity in devising new ways to improve this interface. For it is both enlightened self-interest and practical patriotism for all of us to join in seeing to it that Defense dollars do their full duty for our country.

Trends in AF R&D
(Continued from Page 16)

knowledge and "building blocks" to develop a proper defense against it.

The Manned Orbiting Laboratory (MOL) program, for which the Air Force received the go-ahead last year, will contribute greatly to our knowledge of man's usefulness in space. It is not an aggressive program because it poses no military threat to anyone. In fact, all our space programs are peaceful, either in helping to maintain peace or in providing peaceful benefits. But cooperating with the National Aeronautics and Space Administration, the Air Force must provide its share to the mounting store of space knowledge and experience. I am confident that, as a result, we will be better prepared to deal with any military threat from or in space that may arise in the future.

In conclusion, I want to make a comment about the role of research in contributing to our technological superiority. The term "research and development" has almost become one word, with the emphasis on development. Yet, most of the technological advances that are reflected in our weapon systems today had their start in some research laboratory.

We in the Air Force recognize the many independent contributions American industry has made through its research activities, and I encourage your continued efforts in striving for advances in technology which have potential military applications. To the civilian and military scientists of the Air Force as well as to their colleagues in science and industry, to whom we owe these advances, I want to hold out a challenge.

Let us strive not merely for continuing advances in the state of the art but for technological breakthroughs so great that they become, in effect, "technological leaps." Such a leap was represented by the development of the atomic bomb which, to this day, has assured our nuclear superiority and thereby prevented general war. What would this world be like if the atomic bomb had first been developed by the Soviets?

I mentioned the danger of technological surprise. Let us be the ones who surprise our enemies with technological leaps so far-reaching that they would insure our superiority for years to come. That would be the greatest contribution which research *and* development could make to the cause of lasting peace with honor.

Army to Buy New Huey Cobra Helo

The U. S. Army plans to purchase an improved armed helicopter to replace the armed UH-1B now in use.

The new armed helicopter (Huey Cobra) will have greater range, speed and weapons payload. It incorporates the same transmission, engine and rotor system as the UH-1B in a new streamlined fuselage to gain greater performance and maneuverability.

Selection of the interim armed helicopter was the result of a need for an improved weapons helicopter which could be supplied quickly, at low cost and with the least impact on the Army's supply and training base. It will serve as the Army's armed helicopter until the Advanced Aerial Fire Support System is available.

First deliveries of the helicopter, which is built by Bell Helicopter Co., Fort Worth, Tex., are expected by mid-1967. Deployment will take place as soon thereafter as possible.

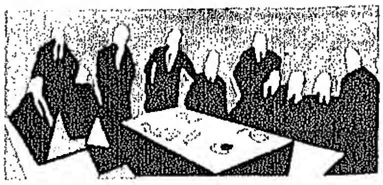
Missions for the new helicopter will be the same as its predecessors—to escort troop-carrying helicopters and provide suppressive fire in the landing zones to support airmobile operations.

The modified helicopter can be deployed directly from the production line to field units without the need for retraining pilots and mechanics. In addition, maximum use of on-site spare parts will be possible.

U.S. Marine Corps Advanced Procurement Information Available

The U.S. Marine Corps has completed procurement planning for three fiscal years for such items as generator sets, special communications central, radio set, tractor and fuel ferrying assembly. The total dollar value of these procurements is on the order of $130 million.

Complete information is available from Mr. J. W. McLain, Director, Procurement Division, Code CSG, Headquarters, U.S. Marine Corps, Room 4000, Arlington Annex, Washington, D.C. 20380, phone (Area Code 202) OXford 4-2582. Mr. McLain will be a counselor at the DOD/National Security Industrial Association Advance Planning Briefing for Industry, at the Sheraton-Park Hotel, Washington, D.C., April 27-28.



MEETINGS AND SYMPOSIA

MAY

Fifth Turbine Engine Lubrication Conference. May 23-25, at the Granada Hotel, San Antonio, Tex. Co-sponsors: Air Force Aero Propulsion Laboratory, Research and Technology Div. (AFSC), and Southwest Research Institute. Contact: G. A. Beane, Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio, (Area Code 513) 253-7111.

JUNE

Electromagnetic Windows Symposium, June 1-3, at the Georgia Institute of Technology, Atlanta, Ga. Sponsor: Air Force Avionics Laboratory. Contact: R. Ireland (AVWE-3), Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio 45433, (Area Code 513) 253-7111, ext. 55720.

Fifth U.S. National Congress of Applied Mechanics, June 14-16, at the University of Minnesota, Minneapolis, Minn. Sponsors: Air Force Office of Scientific Research, Office of Naval Research, Army Research Office, American Physical Society, American Society of Mechanical Engineers for Experimental Stress Analysis, American Institute of Aeronautics and Astronautics, American Mathematical Society, Society for Rheology and American Society for Testing and Materials. Contact: Maj. Lawrence P. Monahan, Jr., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706, (Area Code 919) 286-2285.

International Conference on Crystal Growth, June 20-24, in Boston, Mass. Sponsor: Air Force Cambridge Research Laboratories. Contact: Charles S. Sahagian (CRWPC), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01731, (Area Code 617) CR 4-6100, ext. 3298.

Low Speed Aerodynamic Problems Associated with Helicopters and V/STOL Aircraft, June 22-24, in Buffalo, N.Y. Co-sponsors: Army Aviation Materiel Laboratories and Cornell Aeronautical Laboratory, Inc. Contact: John E. Yeates, Army Aviation Materiel Laboratories, Fort Eustis, Va. 23604, (Area Code 703) 878-4101.

Second Rochester Conference on Coherence and Quantum Optics, June 22-24, at University of Rochester, Rochester, N.Y. Co-sponsors: Air Force Office of Scientific Research and Air Force Cambridge Research Laboratories. Contact: Dr. M. C. Harrington (SRPP), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave. SW, Washington, D.C. 20333, (Area Code 202) OXford 6-4464.

Cold Spring Harbor Symposium on Quantitative Biology, dates undetermined, in Cold Spring Harbor, N.Y. Sponsors: Cold Spring Laboratory for Quantitative Biology, Air Force Office of Scientific Research, National Institute of Health, National Science Foundation and Atomic Energy Commission. Contact: Dr. R. V. Brown (SRLA), Air Force Office of Scientific Research, Tempo D, 4th St. and Independence Ave., SW, Washington, D.C. 20333, (Area Code 202) OXford 6-4181.

JULY

Solid Propulsion Conference, week of July 18, in Washington, D.C. Co-sponsors: Interagency Chemical Rocket Propulsion Group and American Institute of Aeronautics and Astronautics. Contact: P. J. Martin, Chemical-Propulsion Information Agency, 8621 Georgia Ave., Silver Spring, Md. 20910, (Area Code 301) 589-7700, ext. 560.

AUGUST

Eleventh International Symposium on Combustion, Aug. 14-20, at the University of California, Berkeley, Calif. Co-sponsors: Ballistic Research Laboratory and the Combustion Institute of Pittsburgh, Pa. Contact: Dr. R. J. Heaston, Physical Sciences Div., Army Research Office, 3045 Columbia Pike, Arlington, Va., (Area Code 202) OXford 4-3465.

Unguided Rocket Ballistics, Aug. 30-Sept. 1, at Texas Western College, El Paso, Tex. Sponsor: Army Electronics Research and Development Agency. Contact: V. C. Cochran, Army Electronics Research and Development Agency, White Sands Missile Range, N.M. 88002.

Logic, Computability and Automata, date and place undetermined. Co-sponsors: Hughes Aircraft Co. and the Rome Air Development Center. Contact: C. A. Constantino (EMID), Rome Air Development Center, Griffiss AFB, N.Y. 13440.

Ocean Electronics Symposium, Honolulu, Hawaii, Aug. 29-31. Sponsor: Hawaii Section, Institute of Electrical and Electronics Engineers (IEEE). Contact: Robert R. Hill, Chairman, IEEE Ocean Electronics Symposium Headquarters, 1441 Kapiolani Blvd., Suite 1320, Honolulu, Hawaii, 96814.

USAF Avionics Lab Plans Classified Briefing

The Air Force Avionics Laboratory is planning a classified briefing for industry to be presented in a series of regional meetings. The objective is to expand upon the Technical Objective Document (TOD) Release Program and provide to industry more complete detail on the exploratory development programs of the laboratory during the next two years. The briefing is classified Secret.

Presentations to be made at the briefing will be on:

- Mission, organization, personnel, funds and physical plant of the Air Force Avionics Laboratory.
- Definitions and interrelations of DOD program elements; technical domains of the Air Force Systems Command's Research and Technology Division (RTD); and Technical Objective Documents.
- Recent achievements, existing programs and planned program for next two years on each of the following TOD's:

RTD 67-5, Avionic Communication.

RTD 67-6, Bionics, Lasers and Molecular Electronics.

RTD 67-13, Transmission and Reception Above 15 GH's.

RTD 67-15, Electromagnetic Vehicle Environment.

RTD 67-16, Electromagnetic Warfare.

RTD 67-27, Navigation, Guidance and Defense.

RTD 67-28, Photo Materials and Optronics.

RTD 67-29, Position and Motion Sensing.

RTD 67-34, Reconnaissance.

Locations and dates of the meetings are:

- Dayton Ohio, May 19, 1966.
- Los Angeles, Calif., Aug. 27, 1966.
- Washington, D.C., Sept. 1966 (exact date not yet determined).

Names and mailing addresses of individuals from industry and research organizations desiring to attend the various regional meetings should be furnished to:

Hq., Research and Technology Div.
Attn: Mr. Ted Patterson (RTS)
Air Force Systems Command
Bolling Air Force Base
Washington, D. C. 20332

CALENDAR OF EVENTS

April 28: Property Administration Assn. Annual Seminar, Hotel New Yorker, New York City.

May 1-4: American Institute of Chemical Engineers Meeting, Columbus, Ohio.

May 5: American Ordnance Assn. Annual Meeting, Washington Hilton Hotel, Washington, D.C.

May 10-12: National Telemetering Conference, Boston, Mass.

May 11: National Aerospace Services Assn. Annual Meeting, Washington, D.C.

May 11-13: American Helicopter Society Meeting, Sheraton Park Hotel, Washington, D.C.

May 16-18: National Aerospace Electronics Conference, Dayton, Ohio.

May 16-20: American Society of Civil Engineers Meeting, Denver, Colo.

May 17-19: National Security Industrial Assn./Navy Anti-Submarine Warfare Interspace Conference, Washington, D.C.

May 19-20: Southern Research Institute "Membrane Processes for Industry" Symposium, Birmingham, Ala.

May 21: Armed Forces Day.

May 31-June 2: American Society for Quality Control Meeting, New York City.

June 2-4: American Society for Metals/Eastern Regional Exhibition and Conference, Boston, Mass.

June 6-10: Society of Automotive Engineers Convention, Detroit, Mich.

June 6-10: Society of Plastic Industries Convention, New York City.

June 7-9: Armed Forces Communications & Electronics Assn. Convention, Sheraton-Park Hotel, Washington, D.C.

June 12-15: American Society for Mechanical Engineers Meeting, Philadelphia, Pa.

June 19-23: Assn. of Industrial Advertisers Meeting, New York City.

June 19-21: Communication Workers of America Meeting, St. Louis, Mo.

June 20-23: American Nuclear Society Meeting, Denver, Colo.

June 21-24: Data Processing Management Assn. Meeting, Chicago, Ill.

Operational Symposium Will Be Highlight of AHS Forum

An Operational/Mangement Symposium will be one of the highlights during the American Helicopter Society Forum, May 11-13, at the Sheraton Park Hotel, Washington, D.C.

The symposium discussions by industry and military officials will cover topics on tactical retrieval of aircraft and personnel, human factors, cost effectiveness and combat effectiveness in procurement decisions, VTOL on the moon and program management concepts industry and military practices. Its objective is to provide for updating attendees and an exchange of ideas and experience between the DOD and industry.

For further information contact Mr. Edward W. Goshorn, Suite 1200, 1625 K Street NW, Washington, D.C. 20006, (Area Code 202) 737-3367.

Army To Organize Chaparral/Vulcan Air Defense Battalions

The Army plans to organize new air defense battalions armed with the Chaparral guided missile and the Vulcan automatic gun to meet the needs of field commanders for low altitude air defense in forward battle areas.

Each new battalion of [illegible] men will have two Chaparral and two Vulcan firing batteries.

The Chaparral is mounted on an M 548 self propelled vehicle. Its long range will be complemented by the quick reaction and extremely low altitude capability of the M 61A 20mm Vulcan automatic gun which will also be vehicle mounted.

Field Army air defense is now provided by the Nike Hercules, a medium and high altitude guided missile, and the Hawk, a medium and low altitude missile. The new battalions will fill in the low level defense, and complement the hand-held Redeye missile now entering the Army's inventory.

Additional air defense support for the field will come when 40mm gun (Duster) battalions and quad 50 batteries are activated.

Modification of C-123 Aircraft Initiated by AFLC

A two year program for the installation of auxiliary jet engines on piston powered C-123B transport aircraft has been initiated by the Air Force Logistics Command, Wright-Patterson AFB, Ohio.

The program calls for installation of auxiliary jet engines alongside the C-123's two reciprocating engines. It also includes a modulated anti-skid brake system, with new wheels and brakes, and a new stall warning system.

One hundred and twenty aircraft will be involved in the modification project. Delivery of the first modified aircraft is scheduled for November and completion of the project is expected by December 1967.

Fairchild Hiller Corp., of Hagerstown, Md., has received initial Air Force funding of $2.6 million for the project. The contract was awarded by the Warner-Robins Air Materiel Area, Robins AFB, Ga., system support manager for the C-123.

Marine Corps Activating New Division at Camp Pendleton

The U. S. Marine Corps began activation of a new division March 1, with the formation of the first regimental unit of the new group at Camp Pendleton, Calif. The new division, designated the Fifth, brings the Marine Corps strength up to four divisions.

Regimental Landing Team 26, consisting of the 26th Marine Regiment, and supporting elements, was the first unit of the new division to become active. Two more regiments, the 27th and 28th, will be formed before the end of the year. An artillery regiment, designated the 13th Marines, will also be added.

The division is expected to be fully manned within a year. Headquarters and major portions of the division will be located at Camp Pendleton. One battalion landing team, plus aviation elements, will be based at Kaneohe Bal, Hawaii.

Since the activation of the division is scheduled in increments, some battalion landing teams will reach full operational readiness by the time the entire division is formed.

NOTES FOR EDITORS

Briefed below are some events and projects within the Department of Defense which may be of interest to writers and editors. If further information on any of these topics is desired, please write to Chief, Magazine and Book Branch, Office of Assistant Secretary of Defense (Public Affairs), Washington, D.C., 20301.

"MAN AMPLIFIER" TO AUGMENT HUMAN STRENGTH AND ENDURANCE

The U.S. Navy is developing a unique exoskelton suit which can be worn like an outer garment to augment a person's ability to lift and move heavy objects.

The suit, which contains its own power supply, is a jointed, load bearing framework which enables the wearer to perform tasks beyond his normal ability or which would demand prolonged exertion.

With the aid of the exoskelton suit, a man will be able to lift as much as 1,500 pounds to a height of six feet and be able to carry the load at least 25 feet in about 10 seconds.

Enough joints will be included in the suit to allow the wearer to walk, bend, turn, lift, climb, push and pull with ease. The "gloves" of the suit will be flexible enough to permit the man to climb ladders, grip handles and ropes and handle objects of different sizes and shapes.

The final product will be used for such tasks as handling armament in confined shipboard quarters and for moving heavy cargo that now requires special mechanical equipment. Further refinement of the suit is planned to permit its use in deep sea salvage and search-and-rescue missions.

ARMED FORCES DAY TO BE OBSERVED MAY 21

The seventeenth annual Armed Forces Day will be observed May 21 as the nation pauses to honor the men of the Army, Navy, Air Force, Marine Corps and Coast Guard.

Because of the significance of the holiday and since so many people are connected, either directly or indirectly (through active duty, the reserves or defense industry) with the Armed Services, many editors may be interested in obtaining information to commemorate this day in their publications.

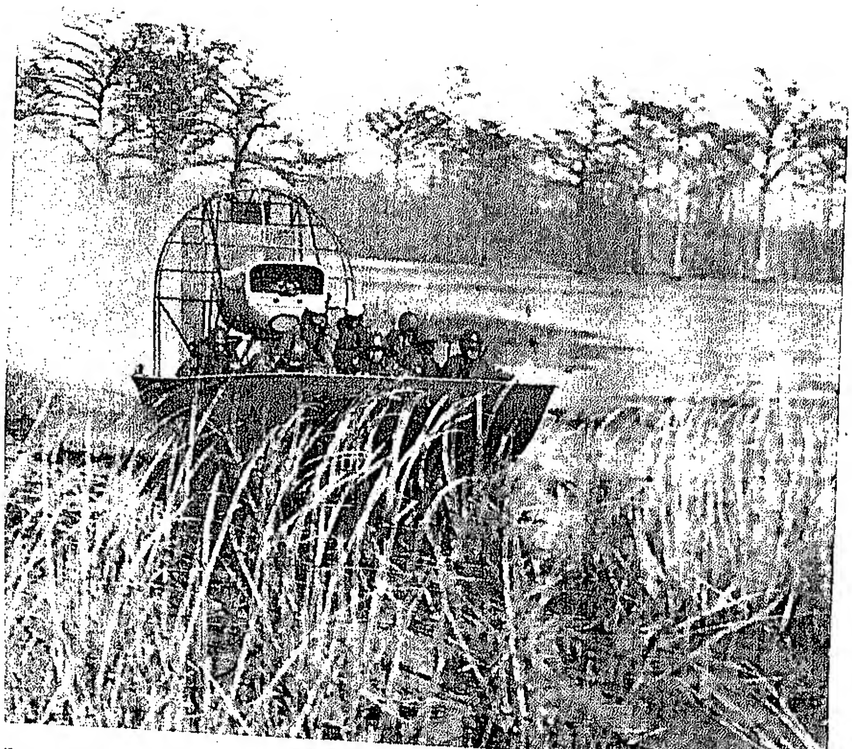
When requesting information and photographs from the Magazine and Book Branch for your Armed Forces Day layout, please outline your needs as specifically as possible so that requests can be filled promptly and accurately.

ARMY DEVELOPS COMPUTERIZED MECHANIC FOR WHEELED VEHICLES

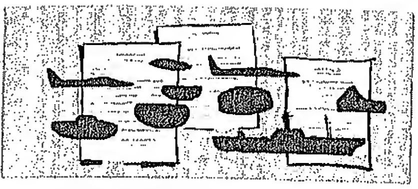
The U.S. Army has developed a new automatic diagnostic system called "Readymaids" which is capable of determining the cause of malfunctions of certain types of wheeled vehicles in less than five minutes.

Transportable in a jeep, the computerized "mechanic" detects the fault, types out in English a description of the cause, then lists the parts required by number and repair manual reference.

The diagnostic cycle is started by giving the computer basic information such as vehicle type and engine serial number. If the input includes mismatched information, the data is returned for correction. The typed data serves as permanent log for vehicle maintenance.



'he Army's new shallow draft "swamp buggy" plows through weed-infested 'aters during recent tests in the Florida Everglades. The new boat will be used to increase the mobility of infantrymen in swampy areas.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of March 1966:

DEFENSE SUPPLY AGENCY

3—American Finishing Co., Memphis, Tenn. $4,072,509. 4,240,006 yards of cotton duck cloth. Memphis. Defense Personnel Support Center, Philadelphia.

—J. P. Stevens & Co., New York City. $1,166,590. 1,184,872 yards of cotton duck cloth. New York City. Defense Personnel Suport Center, Philadelphia.

—Mount Vernon Mills, Baltimore, Md. $2,459,228. 3,115,653 yards of cotton duck cloth. Baltimore. Defense Personnel Support Center, Philadelphia.

—Prestex, Inc., New York City. $3,067,343. 2,786,000 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

—B. G. Colton, Division of Raylon Fabrics, New York City. $1,395,000. 1,012,713 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Graniteville Co., New York City. $2,099,-479. 2,300,002 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

—West Point-Pepperell, Inc., New York City. $3,730,722. 3,465,198 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

4—The Defense Fuel Supply Center, Alexandria, Va. is awarding the following contracts for JP-5 jet fuel:

Humble Oil & Refining Co., Houston, Tex. $10,097,500. 115,000,000 gals.
Socony Mobil Oil Co., New York City. $6,299,067. 73,194,240 gals.
Sun Oil Co., Philadelphia. $5,661,012. 60,480,000 gals.
Union Oil Company of California, Los Angeles. $8,801,854. 96,603,000 gals. $1,533,692. 14,747,040 gals.
Gulf Oil Corp., New York City. $3,724,-880. 42,180,000 gals.
Hess Oil & Chemical Corp., Perth Amboy, N.J. $1,810,545. 18,345,000 gals.
Edgington Oil Refineries, Inc., Long Beach, Calif. $1,324,440. 11,700,000 gals.
Tidewater Oil Co., Los Angeles. $1,145,-000. 10,000,000 gals.
Coastal States Petrochemical Co., Houston, Tex. $3,389,118. 29,247,000 gals.
Cities Service Oil Co., New York City. $1,849,860. 20,000,000 gals.
Pure Oil Co., Palatine, Ill. $1,540,800. 17,010,000.

—The Defense Personnel Support Center, Philadelphia, is awarding the following contracts for tropical combat boots:

Safety First Shoe Co., Nashville, Tenn. $2,700,432. 263,400 pairs.
Endicott Johnson Corp., Endicott, N.Y. $2,011,200. 100,000 pairs.
Bata Shoe Co., Belcamp, Md. $1,891,200. 100,000 pairs.
Hi-pals Footwear, Waynesville, N.C. $1,657,350. 145,000 pairs.
Randolph Mfg. Co., Randolph, Mass. $1,619,455. 126,144 pairs.

—Delta Petroleum Co., New Orleans. $1,940,-978. 4,699,435 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va.

—C. M. London Co., New York City. $1,202,-361. 2,112,000 yards of polyester cotton broadcloth. New York City. Defense Personnel Support Center, Philadelphia.

7—Montgomery Pipe & Tube Co., Dania, Fla. $4,725,275. 439,152 coils of concertina wire. Dania. Defense Construction Supply Center, Columbus, Ohio.

—Northwestern Steel & Wire Co., Mount Sterling, Ill. $1,630,318. 159,992 coils of concertina wire. Mount Sterling. Defense Construction Supply Center, Columbus, Ohio.

—Agri-Tec Steel Corp., Johnstown, Ohio. $1,523,613. 154,056 coils of concertina wire. Johnstown. Defense Construction Supply Center, Columbus, Ohio.

—Kings Point Mfg. Co., Fayetteville, N.C. $2,906,076. 326,159 poncho liners. Fayetteville. Defense Personnel Support Center, Philadelphia.

9—U.S. Rubber Co., Mishawaka, Ind. $5,778,-814. 2,146 sets of nylon runway and taxiway surfacing membrane. Mishawaka. Defense Construction Supply Center, Columbus, Ohio.

—Reeves Bros., New York City. $3,421,324. 1,067 sets of nylon runway and taxiway surfacing membrane. New York City. Defense Construction Supply Center, Columbus, Ohio.

—Colonial Corp. of America, Woodbury, Tenn. $1,655,219. 865,248 men's blue chambray shirts. Woodbury. Defense Personnel Support Center, Philadelphia.

10—Edgington Oil Refineries, Long Beach, Calif. $1,015,512. 570,000 barrels of No. 6 bunker fuel. Defense Fuel Supply Center, Alexandria, Va.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for grade JP-4 jet fuel:

Standard Oil Co. of Calif., San Francisco. $23,524,836. 236,717,284 gals.
American Oil Co., Chicago. $16,151,529. 168,143,000 gals.
Humble Oil & Refining Co., Houston, Tex. $15,097,000. 180,000,000.
Union Oil Co. of Calif., Los Angeles. $14,579,869. 152,806,500 gals.
Continental Oil Co., Houston, Tex. $11,944,192. 133,285,000 gals.
Cities Service Oil Co., New York City. $10,349,543. 120,750,000 gals.
Texaco, Inc., New York City. $9,423,540. 113,400,000 gals.
Shamrock Oil & Gas Corp., Amarillo, Tex. $6,482,500. 64,000,000 gals.
Coastal States Petrochemical Co., Houston, Tex. $4,875,617. 53,227,000 gals.
Douglas Oil Co. of Calif., Los Angeles. $4,820,300. 49,600,00 gals.
Sinclair Refining Co., New York City. $4,677,914. 56,880,000 gals.
Signal Oil & Gas Co., Houston, Tex. $4,051,100. 48,000,000 gals.
Standard Oil Co., Cleveland, Ohio. $3,999,000. 40,000,000 gals.
MacMillan Ring-Free Oil Co., Los Angeles. $3,920,730. 40,000,000 gals.
Bell Oil & Gas Co., Tulsa, Okla. $3,892,-125. 46,609,000 gals.
Golden Eagle Refining Co., Los Angeles. $3,864,000. 39,000,000 gals.
Delta Refining Co., Memphis, Tenn. $3,860,595. 39,383,600.
Richfield Oil Corp., Los Angeles. $3,772,-062. 37,800,000 gals.
Suntide Refining Co., Tulsa, Okla. $3,741,000. 45,000,000 gals.
Phillips Petroleum Co., Bartlesville, Okla. $3,560,667. 41,580,000 gals.
American Petrofina Co. of Tex., Dallas, Tex. $3,429,340. 37,500,000 gals.
Chevron Oil Co., El Paso, Tex. $3,236,-200. 34,000,000 gals.
Sunray DX Oil Co., Tulsa, Okla. $2,876,-100. 33,915,000 gals.
Howell Refining Co., San Antonio, Tex. $2,581,923. 27,346,000 gals.
Leonard Refineries, Inc., Alma, Mich. $2,392,590. 24,500,000 gals.
Northwestern Refining Co., St. Paul Park, Minn. $2,244,012. 23,195,000 gals.
Triangle Refineries, Houston, Tex. $2,079,440. 22,000,000 gals.
Sioux Oil Co., Newcastle, Wyo. $1,976,076. 17,100,000 gals.
Tesoro Petroleum Corp., Carrizo Springs, Tex. $1,975,840. 18,500,000 gals.
Champlin Petroleum Co., Fort Worth, Tex. $1,912,200. 20,500,000 gals.
Tidewater Oil Co., Los Angeles. $1,908,-900. 18,000,000 gals.
Hercules Oil Co., San Diego, Calif. $1,880,990. 17,855,000 gals.
Golden Eagle Refining Co., Los Angeles. $1,776,400. 18,000,000.
Permian Corp., Houston, Tex. $1,717,425. 17,793,000 gals.
Hunt Oil Co., Dallas, Tex. $1,685,300. 19,000,000 gals.
Kerr-McGee Corp., Oklahoma City, Okla. $1,639,825. 19,545,000 gals.
Southland Oil Co., Yazoo City, Miss. $1,614,165. 16,090,000 gals.
Derby Refining Co., Wichita, Kan. $1,-524,750. 18,000,000 gals.
Bell Oil & Gas Co., Tulsa, Okla. $1,112,-764. 13,391,000 gals.
Mohawk Petroleum Corp., San Francisco. $1,068,375. 10,500,000 gals.
Fletcher Oil Co., Wilmington, Calif. $1,030,240. 10,500,000 gals.
Socony Mobil Oil Co., New York City. $15,647,818. 173,415,000 gals.
Ashland Oil & Refining Co., Ashland, Ky. $7,522,851. 77,187,000 gals.
Debco Corp., Abilene, Tex. (2) $6,480,-602. 67,527,000 gals. $1,720,693. 17,293,-000 gals.
Crystal Flash Petroleum Corp., Indianapolis, Ind. $2,139,114. 20,010,000 gals.
Monarch Refining Co., San Antonio, Tex. $1,147,130. 11,850,000 gals.

11—Orthopedic Equipment Co., Bourbon, Ind. $2,386,120. 187,000 folding canvas cots. Bourbon. Defense General Supply Center, Richmond, Va.

—Sidran Sportswear, Inc., Dallas, Tex. $1,-225,500. 30,000 men's wool gabardine overcoats. Dallas. Defense Personnel Support Center, Philadelphia.

14—Borg-Warner Corp., Chicago. $2,512,900. 752,880 steel helmets. Chicago. Defense Personnel Support Center, Philadelphia.

15—Eastman Kodak Co., Rochester, N.Y. $1,-072,954. 7,300 rolls of aerial photographic film. Rochester. Defense General Supply Center, Richmond, Va.

—Cavalier Bag Co., Lumberton, N.C. $1,-705,600. Sand bags. Lumberton. Defense General Supply Center, Richmond, Va.

—Standard Oil Co. of Calif., San Francisco. $1,991,033. 082,000 gallons of automotive gasoline and 15,902,000 gallons of grade DF-A arctic fuel oil. Defense Fuel Supply Center, Alexandria, Va.

—Tanenbaum Textile Co., New York City. $2,440,200. 9,000,000 yards of nylon netting cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Putnam Mills, Corp., New York City. $1,-108,090. 3,821,000 yards of nylon netting cloth. New York City. Defense Personnel Support Center, Philadelphia.

16—Habag Corp., New York City. $1,307,561. 12,940,000 pounds of 22-gauge steel sheets. New York City. Defense Industrial Supply Center, Philadelphia.

17—The Defense Fuel Supply Center, Alexandria, Va., is awarding the following contracts for diesel and fuel oil:

Standard Oil Co. of Calif., San Francisco. $2,198,000. 1,250,000 barrels of No. 6 fuel oil.
Texaco, Inc., New York City. $1,299,-600. 760,000 barrels of No. 6 fuel oil.
Gulf Oil Corp., Houston, Tex. $1,775,-189. 300,000 barrels of diesel fuel and 800,000 barrels of No. 6 fuel oil.
Socony Mobil Oil Co., New York City. $1,876,866. 374,000 barrels of diesel fuel and 970,000 barrels of No. 6 fuel oil.
Metropolitan Petroleum Co., New York City. $1,053,800. 160,000 barrels of No. 6 fuel oil and 310,000 barrels of Navy Special.

18—Brownwood Mfg. Co., Brownwood, Tex. $2,683,200. 200,000 men's lightweight raincoats. Brownwood. Defense Personnel Support Center, Philadelphia.

21—Rubber Fabricators, Inc., Grantsville, W. Va. $1,897,500. 250,000 pneumatic mattresses. Grantsville. Defense Personnel Support Center, Philadelphia.

—Bruce Products, Inc., Eatontown, N.J. $1,148,581. 107,848 men's wet-weather parkas. Eatontown. Defense Personnel Support Center, Philadephia.

23—LaCrosse Garment Mfg. Co., LaCrosse, Wis. $3,002,458. 850,864 tent shelter

halves. LaCrosse. Defense Personnel Support Center, Philadelphia.

—Southern Athletic Co., Knoxville, Tenn. $1,855,700. 200,000 lightweight men's raincoats. Knoxville. Defense Personnel Support Center, Philadelphia.

24—B. G. Colton, Division of Raylon Fabrics, Inc., New York City. $1,697,980. 1,337,000 yards of wind-resistant cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

25—J. P. Stevens & Co., New York City. $2,145,000. 500,000 yards of wool serge cloth. New York City. Defense Personnel Support Center, Philadelphia.

29—U.S. Rubber Co., Providence, R.I. $2,738,925. 500-gallon rubber drums. Providence. Defense General Supply Center, Richmond, Va.

30—Oscar Mayer Co., Madison, Wis. $1,087,619. 475,848 cans of prefried sliced bacon. Madison. Defense Personnel Support Center, Philadelphia.

—Magline, Inc., Pinconing, Mich. $4,335,078. 10,457 units of frame sections for maintenance tents. Pinconing. Defense Personnel Support Center, Philadelphia.

—Flag-Utica Co., Division of Genesco, Inc., Florence, Ala., $1,205,506. 425,000 pairs of men's shorts. Florence. Defense Personnel Support Center, Philadelphia.

—Stone Mfg. Co., Columbia, S.C. $1,188,301. 2,838,864 pairs of men's cotton shorts. Columbia. Defense Personnel Support Center, Philadelphia.

—Nantex Riviera Corp., New York City. $1,380,666. 3,219,432 pairs of men's cotton shorts. New York City. Defense Personnel Support Center, Philadelphia.

ARMY

1—University of Michigan, Ann Arbor, Mich. $1,299,292. Research work. Hawaii and Ann Arbor. Defense Supply Service, Washington, D.C.

—Universal Constructors, Inc., Albuquerque, N.M. $4,547,000. Work on the Albuquerque, N.M. diversion channel project. Albuquerque. Engineer Dist., Albuquerque, N.M.

—Eitel McCullough, Inc., San Carlos, Calif. $1,143,650. Klystron electron tubes. San Carlos. Army Electronics Command, Fort Monmouth, N.J.

—Union Carbide Corp., New York City. $6,196,213. Components for radio sets. Chemway, N.C. Army Electronics Command, Fort Monmouth, N.J.

—M. Steinthal & Co., New York City. $1,268,787. Personnel reserve parachutes. Roxboro, N.C. Army Aviation Materiel Command, St. Louis.

—Martin Marietta, Orlando, Fla. $2,000,000. Components for ordnance items. Orlando. Picatinny Arsenal, Dover, N.J.

—Sperry Rand Corp., Salt Lake City, Utah. $1,989,010. Inspection equipment and armament subsystems (M5) for helicopters. Salt Lake City. Army Weapons Command, Rock Island, Ill.

—Kaiser Jeep Corp., Toledo, Ohio. $2,019,085. Utility trucks. Toledo. Army Tank Automotive Center, Warren, Mich.

—Aerojet General, Downey, Calif. $1,507,953. Ordnance items. Downey. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Scovill Mfg. Co., Waterbury, Conn. $1,434,312. Ordnance items. Waterbury. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Whirlpool Corp., Evansville, Ind. $1,870,844. 106mm projectile parts. Evansville. Picatinny Arsenal, Dover, N.J.

—FMC Corp., San Jose, Calif. $1,976,120. Metal parts for 106mm projectiles. San Jose. Picatinny Arsenal, Dover, N.J.

—Northrop Corp., Anaheim, Calif. $2,084,081. 106mm projectile components. Anaheim. Picatinny Arsenal, Dover, N.J.

—Honeywell, Inc., Hopkins, Minn. $3,007,095. Metal parts for grenade assemblies. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Gar-Let Mfg. Co., Philadelphia. $1,579,800. Cable assemblies. Old Forge, Pa. Army Electronics Command, Philadelphia.

2—Hyde Construction Co., Jackson, Miss. $2,920,967. Work on the Okatibee Reservoir. Meridian, Miss. Engineer Dist., Mobile, Ala.

—SCM Corp., Deerfield, Ill. $1,396,030. Teletypewriter sets with ancillary items. Deerfield. Army Electronics Command, Philadelphia.

—Eureka-Williams Co., Bloomington, Ill. $2,196,201. Ordnance items. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.

—U.S. Time Corp., Waterbury, Conn. $4,827,435. Production of ammunition components; provision for new production facilities; and repair, freight, installation and reactivation of government owned production equipment. Waterbury. Ammunition Procurement & Supply Agency, Joliet, Ill.

3—SCM Corp., Deerfield, Ill. $1,410,872. Teletypewriter sets with ancillary items. Deerfield. Army Electronics Command, Philadelphia.

—Mike Bradford & Co., Miami, Fla. $1,385,000. Construction of a special forces complex. Fort Bragg, N.C. Engineer Dist., Savannah, Ga.

—United Aircraft, Stratford, Conn. $1,200,000. Long lead time items and components for manufacture and delivery of FY 66 quantity of CH-54A helicopters. Stratford. Army Aviation Materiel Command, St. Louis.

7—Thiokol Chemical Corp., Bristol, Pa. $7,699,089. Ammunition and for operation and maintenance activities at the Long Horn Army Ammunition Plant, Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Hoel-Steffen Construction Co., Afton, Mo. $1,279,922. Construction work at the Lake City Army Ammunition Plant, Independence, Mo. Engineer Dist., Kansas City, Mo.

8—Somerset Construction Co., Wilmington, N.C. $1,797,447. Work on the Charleston, S.C., Harbor and Shipyard River Project. Engineer Dist., Charleston, S.C.

—Prestolite Co., Division of Eltra Corp., Toledo, Ohio. $2,052,550. 25-ampere generators for trucks. Bay City, Mich. Army Tank Automotive Center, Warren, Mich.

—Fairchild Camera & Instrument Corp., Paramus, N.J. $2,000,000. Radio transmitter modulators and other equipment. Paramus. Army Electronics Command, Philadelphia.

9—FMC Corp., Charleston, W. Va. $2,100,000. M113A1 vehicle spare parts. Charleston. Northwest Procurement Agency, Oakland, Calif.

—Flinchbaugh Products, Red Lion, Pa. $2,091,653. Metal parts for 90mm projectiles. Red Lion. Ammunition Procurement & Supply Agency, Joliet, Ill.

10—Galion Amco, Galion, Ohio. $1,412,400. Metal parts for detonating fuzes. Galion. Frankford Arsenal, Philadelphia.

—Z.D. Products, Division of Wells Marine, Inc., El Segundo, Calif. $2,212,000. Production of metal parts for detonating fuzes. El Segundo. Frankford Arsenal, Philadelphia.

—Bermite Powder Co., Saugus, Calif. $5,230,320. Detonating fuzes. Saugus. Frankford Arsenal, Philadelphia.

—Norfolk Dredging Co., Norfolk, Va. $1,856,660. Work on Norfolk Harbor Channel Project. Engineer Dist., Norfolk, Va.

—American Fabrication Products Co., Indianapolis, Ind. $2,048,150. Mortar shell fin assemblies. Indianapolis. Army Procurement Detachment, Chicago.

—Cone Bros. Construction Co., Tampa, Fla. $2,943,512. Work on the Cross Florida Barge Canal Project. Putnam County, Florida. Engineer Dist., Jacksonville, Fla.

11—Ingraham Co., Bristol, Conn. $2,980,130. Metal parts for artillery fuzes. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

14—FMC Corp., San Jose, Calif. $1,151,738. Advance production engineering for HAWK launchers. San Jose. Army Tank Automotive Center, Warren, Mich.

—Magnavox Co., Torrance, Calif. $2,369,000. Radio communications sub-system and ancillary items. Torrance. Army Electronics Command, Fort Monmouth, N.J.

—T. C. Young Construction Co., Williamsburg, Ky. $1,860,045. Work on the Grayson Reservoir Project. Grayson, Ky. Engineer Dist., Huntington, W. Va.

—Wiley & Jackson Co., Roanoke, Va. $7,968,385. Work on the Cross Florida Barge Canal Project. Marion County, Fla. Engineer Dist., Jacksonville, Fla.

—Harvey Aluminum, Inc., Torrance, Calif. $1,975,000. 20mm projectiles. Torrance. Frankford Arsenal, Philadelphia.

—Maxson Electronics Corp., Great River, N.Y. $1,349,423. 20mm projectiles. Macon, Ga. Frankford Arsenal, Philadelphia.

15—Harris & Brooks, Riverdale, Md. $1,781,105. Work on the Hannibal Lock & Dam, Ohio River, Project. Engineer Dist., Pittsburgh, Pa.

—Raytheon Co., Lexington, Mass. $1,872,138. Engineering services for the self-propelled HAWK system. Andover and Bedford, Mass. Army Mobility Command, Huntsville, Ala.

—Raytheon Co., Lexington, Mass. $4,507,000. Design and development of the HAWK ATBM/HIP (Anti-Tactical Ballistic Missile/Hawk Improvement Program) missile system. Andover and Bedford, Mass. Army Mobility Command, Huntsville, Ala.

—AVCO Corp., Stratford, Conn. $2,599,000. Product improvement services for calendar year 1966 for T-53 engines for UH-1 helicopters. Stratford. Army Aviation Command, St. Louis.

—AVCO Corp., Stratford, Conn. $2,838,843. Product improvement services for calendar year 1966 for T-55 engines for CH-47 helicopters. Stratford. Army Aviation Command, St. Louis.

—Bell Helicopter Co., Division of Bell Aerospace Corp., Fort Worth, Tex. $2,691,761. Transmissions for UH-1 helicopters. Fort Worth. Army Aviation Material Command, St. Louis.

—Cadillac Gage Co., Warren, Mich. $1,675,000. Armored cars. Warren. Army Tank Automotive Center, Warren, Mich.

16—Microwave Associates, Inc., Burlington, Mass. $1,164,450. Electron tubes for AN/PSS 4 radar sets. Burlington. Army Electronics Command, Philadelphia.

—AVCO Corp., Stratford, Conn. $6,480,000. Aircraft engines for the CH-47 aircraft. Stratford. Army Aviation Materiel Command, St. Louis.

—General Dynamics, Rochester, N.Y. $13,583,904. Radio sets and mountings. Rochester. Army Electronics Command, Philadelphia.

17—Elmer G. Wendt, Inc., Sacramento, Calif. $1,991,626. Work on the San Joaquin River Flood Control Project. Manteca, Calif. Engineer Dist., Sacramento, Calif.

—Ford Motors, Dearborn, Mich. $3,986,764. ¼-ton trucks. Highland Park, Mich. Army Mobility Command, Warren, Mich.

—Bell Helicopter Co., Fort Worth, Tex. $2,300,000. Procurement of UH-1E helicopters. Hurst, Tex. Army Aviation Command, St. Louis.

18—AVCO Corp., Stratford, Conn. $1,194,695. Nozzle and cylinder assemblies for UH-1 helicopters. Stratford. Army Aviation Materiel Command, St. Louis.

—Chaney & James Construction Co., Richardson, Tex. $1,505,309. Work on the Foster Reservoir, Oregon, Project. Sweet Home, Ore. Engineer Dist., Portland, Ore

—Lear Siegler, Inc., Anaheim, Calif. $4,400,000. Production of classified electronics equipment. Anaheim. Army Electronics Command, Fort Monmouth, N.J.

21—Chaney & James & Gibralter Construction Co., Richardson, Tex. $2,073,161. Construction of a vacuum telescope laboratory Sacramento Peak, N.M. Engineer Dist. Albuquerque, N.M.

—Sperry-Utah Co., Sperry-Rand Corp., Salt Lake City, Utah. $2,061,610. Sergeant Phase II ground electronics research & development program. Salt Lake City Army Missile Command, Huntsville, Ala

22—General Electric, West Lynn, Mass. $1,600,000. Production of engines to support the Advanced Aerial Fire Support System West Lynn. Army Aviation Material Command, St. Louis.

—AVCO Corp., Stratford, Conn. $21,625,000 Production of helicopter engines. Stratford. Army Aviation Material Command St. Louis.

—R. M. Well, Co., Quanah, Tex. $1,676,99 Conversion of building facilities at Robi AFB, Ga. Engineer Dist., Savannah, G

—Acushnet Process Co., New Bedford, Mas $1,400,828. Production of Navy Protecti masks. New Bedford. Edgewood Arsen Md.

23—Western Contracting Corp., Sioux Ci Iowa. $17,117,530. Work on the Stockt Reservoir Project. Stockton, Mo. En neer Dist., Kansas City, Mo.

—Lockheed Aircraft, Burbank, Calif. $1 700,000. Engineering development of t Advanced Aerial Fire Support Syste Los Angeles, Ventura and Rivers

Counties, Calif. Army Aviation Materiel Command, St. Louis.

24 **Champion Co.**, Springfield, Ohio. $1,461,070. Shipping and storage containers. Springfield. Ammunition Procurement & Supply Agency, Joliet, Ill.

Aerojet General Corp., Downey, Calif. $2,449,496. Bomb dispenser assemblies. Downey. Ammunition Procurement & Supply Agency, Joliet, Ill.

25 **Prestolite Co., Division of Eltra Corp.**, Toledo, Ohio. $2,227,139. Automotive storage batteries. Reading, Pa., Vincennes, Ind., Oakland, Calif. and East Point, Ga. Army Tank Automotive Center, Warren, Mich.

Thurmont Construction Co., Thurmont, Md. $1,337,989. Construction of a guided missile maintenance shop and additions to existing structures. Letterkenny Army Depot, Chambersburg, Pa. Engineer Dist., Baltimore, Md.

Pioneer Aerodynamic Systems, Inc., Manchester, Conn. $1,846,553. Parachute canopies. Columbia, Miss. Army Aviation Materiel Command, St. Louis.

Boeing Co., Morton, Pa. $6,410,761. Modification of four CH-47A helicopters to an armed and armored configuration. Morton. Army Aviation Materiel Command, St. Louis.

26 **Philco Corp.**, Philadelphia. $1,663,262. Seven technical control communications centers and ancillary items. Philadelphia. Army Electronics Command, Fort Monmouth, N.J.

28 **H. K. Ferguson**, Cleveland, Ohio. $1,634,620. Construction of a water filtration plant at the Holston Army Ammunition Plant, Kingsport, Tenn. Engineer Dist., Mobile, Ala.

Morrow County School Dist., Lexington, Ore. $1,242,000. Construction of a high school at Boardman, Ore. Engineer Dist., Walla Walla, Wash.

Martin Marietta, Orlando, Fla. $1,525,506. Supplies and services relating to test and evaluation of the SHILLELAGH anti-tank missile system. Orlando. Army Missile Command, Huntsville, Ala.

29 **Collins Radio Co.**, Richardson, Tex. $1,053,000. Work on the Pacific Scatter Communications System. Work will be done at various overseas locations. Army Electronics Command, Washington Procurement Div., Alexandria, Va.

30 **A. Teichert & Sons, Inc.**, Irwindale, Calif. $2,952,102. Work on the San Jose Channel City of Industry, Calif. Engineer Dist., Los Angeles.

Bell Co., Milwaukee, Wis. $9,130,991. 5,000-gallon fuel tank semi-trailers and repair parts. Milwaukee. Army Tank Automotive Center, Warren, Mich.

31 **Mack Trucks, Inc.**, Allentown, Pa. $1,536,405. Axle sets for tractor trucks. Hagerstown, Md. and Allentown. Army Tank Automotive Center, Warren, Mich.

Caterpillar Tractor Co., Peoria, Ill. $3,250,000. Advance production engineering services of trucks resulting in fabrication of 10 pilot models. Peoria. Army Tank Automotive Center, Warren, Mich.

International Telephone & Telegraph, Harrisburg, Pa. $1,064,320. Audio-frequency amplifiers. Harrisburg. Army Electronics Command, Philadelphia.

Specialty Electronics Development Corp., Glendale, N.Y. $1,675,000. Manual central office telephone system. Southbridge, Mass. Army Electronics Command, Philadelphia.

Kaiser Jeep Corp., Toledo, Ohio. $34,429,113. Trucks of various body types. Army Mobility Command, Warren, Mich.

Weatherhead Co., Cleveland, Ohio. $2,678,222. Metal parts for 105mm projectiles for the M60 tank weapons system. Coshocton County, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill.

Brava Corp., Bellevue, Wash. $3,041,654. Work on the John Day Lock and Dam Project Klickitat and Benton Counties, Wash. Engineer Dist., Walla Walla, Wash.

Boyertown Auto Body Works, Inc., Boyertown, Pa. $1,602,276. Various types of van bodies. Boyertown. Army Tank Automotive Center, Warren, Mich.

General Motors, Indianapolis, Ind. $2,671,380. Power transfer units for transmissions for the SHERIDAN tank vehicle. Indianapolis. Army Tank Automotive Center, Warren, Mich.

Philco Corp., Newport Beach, Calif. $1,931,000. Six months industrial engineering services on the SHILLELAGH missile system. Newport Beach. Southwest Procurement Agency, Pasadena, Calif.

Philco Corp., Newport Beach, Calif. $1,302,000. Initial equipment maintenance for the SHILLELAGH missile system. Newport Beach. Army Missile Command, Huntsville, Ala.

Philco Corp., Newport Beach, Calif. $1,686,775. Acceptance inspection equipment for the SHILLELAGH missile system. Newport Beach. Army Missile Command, Huntsville, Ala.

NAVY

1 **Santa Fe Engineers, Inc.**, Lancaster, Calif. $1,469,702. Construction of an S-II subassembly building facility at Seal Beach, Calif. Southwest Div., Bureau of Yards & Docks.

Atlantic Research Corp., Alexandria, Va. $2,204,712. Rocket motors for TERRIER missiles. Gainesville, Va. Bureau of Naval Weapons.

Pascoe Steel Corp., Pomona, Calif. $2,149,196. Steel pontoons with fittings and accessories. Pomona. Navy Purchasing Office, Los Angeles.

Astrophysics Research Corp., Los Angeles. $1,070,446. Research of very low frequency propagation. Los Angeles, Norco, and Lucerne Valley, Calif. Navy Purchasing Office, Los Angeles.

Admiral Corp., Chicago. $1,701,220. Radio sets for Army and Navy training aircraft. Chicago. Navy Purchasing Office, Washington, D.C.

Genge Industries, Glendale, Calif. $1,313,107. Engineering and technical services related to weapons systems projects. Port Hueneme, Calif. Navy Purchasing Office, Los Angeles.

Tracor, Inc., Austin, Tex. $1,356,000. Studies and analysis of a Navy surface ship sonar system. Austin. Bureau of Ships.

United Aircraft, East Hartford, Conn. $1,572,000. Spare parts for engines for F-111A aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

2 **General Dynamics**, Groton, Conn. $64,999,966. Three dock landing ships. Groton. Bureau of Ships.

United Aircraft, East Hartford, Conn. $24,000,000. TF-30-P-3 engines. East Hartford. Bureau of Naval Weapons.

Consolidated Diesel Electric Corp., Stamford, Conn. $11,057,305. Skid mounted generator sets. Stockton, Calif. and Stamford. U.S. Marine Corps.

Magnavox Co., Fort Wayne, Ind. $4,251,512. Sonobuoys and related equipment. Fort Wayne. Bureau of Naval Weapons.

4 **AMCO Electric**, San Diego, Calif. $1,011,814. Improvement to utilities plant B at the San Diego Naval Station. Southwest Div., Bureau of Yards & Docks.

United Aircraft, East Hartford, Conn. $1,615,736. Parts used to refit engines for F-4 and F-8 aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

Marquardt Corp., Ogden, Utah. $17,105,000. Nozzle and fin assemblies for 2.75 inch rockets. Ogden. Navy Ships Parts Control Center, Mechanicsburg, Pa.

Farmers Tool & Supply Corp., Denver, Colo. $14,283,000. Nozzle and fin assemblies for 2.75 inch rockets. Denver. Navy Ships Parts Control Center, Mechanicsburg, Pa.

Columbus Milpar Mfg. Co., Columbus, Ohio. $5,985,250. Nozzle and fin assemblies for 2.75 inch rockets. Columbus. Navy Ships Part Control Center, Mechanicsburg, Pa.

Hoffman Electronics Corp., El Monte, Calif. $6,792,261. 2.75 inch rocket nozzle and fin assemblies. El Monte. Navy Ships Parts Control Center, Mechanicsburg, Pa.

American Electric, Inc., Paramount, Calif. $2,601,000. Fins for 2.75 inch rockets. Paramount. Navy Ships Parts Control Center, Mechanicsburg, Pa.

4 **Colton Construction Corp.**, National City, Calif. $1,451,000. Construction of a recovery parachute range at Naval Air Facility, El Centro, Calif. Southwest Div., Bureau of Yards & Docks.

Douglas Aircraft, Long Beach, Calif. $1,227,636. Ejector racks and bomb hoist adapters. Torrance, Calif. Bureau of Naval Weapons.

Hoffman Electronics Corp., El Monte, Calif. $1,390,343. Radio navigation test equipment. El Monte. Navy Aviation Supply Office, Philadelphia.

FMC Corp., Minneapolis, Minn. $1,950,000. Continuation of work on design and development of a 175mm, 60 cal. gun mount. Fridley, Minn. Bureau of Naval Weapons.

Lockheed Aircraft, Sunnyvale, Calif. $26,650,000. Work on POSEIDON missile system. Sunnyvale. Special Projects Office.

Sundstrand Corp., Rockford, Ill. $10,438,860. Spare assemblies for F-4 aircraft. Rockford. Navy Purchasing Office, Washington, D.C.

7 **Tracor, Inc.**, Austin, Tex. $1,802,944. Engineering and technical services in connection with Navy sonar systems. Washington, D.C. Bureau of Ships.

Dow Chemical Co., Camden, N.J. $1,939,388. Aluminum extrusions for airfield matting. Madison, Ill. Naval Air Engineering Center, Philadelphia.

AVCO Corp., Richmond, Ind. $2,102,061. POLARIS missile components. Richmond. Special Projects Office.

8 **L. B. Samford, Inc.**, Miami, Fla. $1,019,700. Relocation of fuel storage at the Naval Station, Key West, Fla. Southeast Div., Bureau of Yards & Docks.

Sparton Corp., Jackson, Mich. $8,740,000. Production of sonobuoys and related equipment. Jackson. Bureau of Naval Weapons.

General Electric, Santa Barbara, Calif. $1,222,646. Study and development of new ASW data collection and analysis systems. Santa Barbara. Office of Naval Research, Washington, D.C.

Kaiser Aluminum & Chemical Sales, Hale Thorpe, Md. $1,486,500. Aluminum extrusions for airfield matting. Hale Thorpe. Naval Air Engineering Center, Philadelphia.

9 **Douglas Aircraft**, Long Beach, Calif. $2,019,000. TA-4E aircraft. Long Beach. Bureau of Naval Weapons.

Amron Corp., Waukesha, Wis. $1,632,900. Facilities for the manufacture of 20mm cartridge cases. Waukesha. Bureau of Naval Weapons.

10 **Dayton T. Brown, Inc.**, Long Island, N.Y. $1,830,866. Preproduction and production lot sample testing of armament and safety equipment for the Navy and Air Force. Long Island. Bureau of Naval Weapons.

Hercules Powder Co., Saugus, Calif. $7,001,349. Mark 125 Mod 4 igniters used on 2.75 rockets. Saugus. Navy Ships Parts Control Center, Mechanicsburg, Pa.

De Val Corp., Philadelphia. $2,083,666. AERO 46A and 47A weapon loaders. Philadelphia. Navy Purchasing Office, Washington, D.C.

United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $11,270,400. TF-30-P-3 engines for the Air Force. East Hartford. Bureau of Naval Weapons.

11 **General Electric**, Schenectady, N.Y. $37,863,100. Reactor plant components for nuclear powered ships. Schenectady. Bureau of Ships.

Stewart-Warner Corp., Chicago. $1,808,316. Radar sets for A-4E and TA-4E aircraft. Chicago. Navy Aviation Supply Office, Philadelphia.

United Aircraft, East Hartford, Conn. $5,326,840. TF-33-P-7 engines for the Air Force. East Hartford. Bureau of Naval Weapons.

14 **Sperry Rand Corp.**, Great Neck, N.Y. $2,616,271. Ships Inertial Navigation Systems. Great Neck. Bureau of Ships.

Goodyear Tire & Rubber Co., Akron, Ohio. $1,402,020. Hose and tank-underlinst assemblies for the Amphibious Assault Fuel System. Litchfield Park, Ariz. U.S. Marine Corps.

Grumman Aircraft Engineering Corp., Bethpage, N.Y. $21,358,000. Production of S-2E aircraft and related equipment. Bethpage. Bureau of Naval Weapons.

15 **Hughes Aircraft**, Fullerton, Calif. $2,838,803. Equipment for shipboard radars. Fullerton. Bureau of Ships.

Sperry Rand Corp., Univac Div., St. Paul, Minn. $4,009,191. Classified equipment. St. Paul. Bureau of Ships.

Sperry Rand Corp., Univac Div., St. Paul, Minn. Programming of computers at the Naval Air Development Center, Johnsonville, Pa. Naval Air Development Center, Johnsonville, Pa.

Head Construction Co., Washington, D.C. $1,221,000. Construction of an addition to the AUTODIN facility at Andrews

Yards & Docks.

—Johns Hopkins University, Silver Spring, Md. $7,869,387. Continued research and development work on guided missile systems. Bureau of Naval Weapons.

—General Dynamics Corp., Pomona, Calif. $34,550,000. TERRIER and TARTAR missiles. Pomona. Bureau of Naval Weapons.

—North American Aviation, Anaheim, Calif. $1,104,000. Repairs to certain models of ship inertial navigation system gyroscopes. Anaheim. Bureau of Ships.

—Raytheon Co., Oxnard, Calif. $2,650,000. Development models of fire control systems for the basic point defense surface missile system program. Oxnard. Navy Purchasing Office, Los Angeles.

16—Collins Radio Co., Cedar Rapids, Iowa. $8,812,360. Components for the AN/ARC 51 radio used on A-4F and P 3A aircraft. Cedar Rapids. Navy Purchasing Office, Washington, D.C.

—Hermite Powder Co., Saugus, Calif. $1,301,969. Fuzes for 20mm projectiles. Saugus. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—General Motors, Indianapolis, Ind. $1,123,200. Conversion kits for T-56 aircraft engines. Indianapolis. Navy Aviation Supply Office, Philadelphia.

—United Aircraft, East Hartford, Conn. $3,505,085. J-75-P-13B engines for the Air Force. East Hartford. Bureau of Naval Weapons.

—General Precision, Inc., Little Falls, N.J. $3,116,251. Production of navigation computer sets for Navy aircraft. Little Falls. Bureau of Naval Weapons.

17—Sperry Rand Corp., Sperry Gyroscope Co., Great Neck, N.Y. $1,061,000. Instrumentation radar sets. Great Neck. Bureau of Naval Weapons.

—North American Aviation, Anaheim, Calif. $2,018,097. Fabrication and test of airborne ASW radar sets. Anaheim. Bureau of Naval Weapons.

—United Aircraft, East Hartford, Conn. $21,534,008. J52-P-8A engines. East Hartford. Bureau of Naval Weapons.

18—Kentron Hawaii Ltd., Honolulu, Hawaii. $11,561,802. Operations and operational maintenance of telemetry installations in the Pacific area. Navy Purchasing Office, Los Angeles.

—United Boatbuilders, Inc., Bellingham, Wash. $2,879,280. 144 landing craft vehicles, personnel (LCVP). Bellingham. Bureau of Ships.

21—Sperry Gyroscope Co., Sperry-Rand Corp., Syosset, N.Y. $1,432,000. Repair components and subsystems of ship inertial navigation system models. Syosset. Bureau of Ships.

—Royal Industries, Inc., Engineer Products Div., Alhambra, Calif. $1,052,070. Aircraft fuel tanks for use on A-4A and TA-4E aircraft. Alhambra. Navy Purchasing Office, Washington, D.C.

22—Doyle and Russell, Inc., Norfolk, Va. $1,024,877. Construction of a briefing theater and communications centers at Atlantic Fleet Headquarters, Norfolk. Atlantic Div., Bureau of Yards & Docks.

—ITT Federal Laboratories, Division of International Telephone & Telegraph Corp., Nutley, N.J. $1,262,481. Receiver transmitters, mountings and control boxes. Camden, Ark. Navy Purchasing Office, Washington, D.C.

—ITT Gilfillan, Inc., Los Angeles. $2,880,844. Engineering support for radar systems. Los Angeles. Bureau of Ships.

23—General Electric, Schenectady, N.Y. $1,180,000. Reactor plant components for naval nuclear powered ships. Schenectady. Bureau of Ships.

24—Sperry Gyroscope Co., Sperry Rand Corp., Syosset, N.Y. $1,500,000. Development of inertial navigation subsystems for submarines. Syosset. Bureau of Ships.

—IBM, Inc., Federal Systems Div., Rockville, Md. $1,310,282. Design and development of a data processing system for use in maintaining intelligence records. Rockville. Bureau of Naval Weapons.

—University of Washington, Applied Physics Laboratory, Seattle, Wash. $1,410,778. Research and development work in the field of underwater ordnance. Seattle. Bureau of Naval Weapons.

—General Precision, Inc., Link Div., Binghampton, N.Y. $1,050,000. Conversion of [illegible] Training Sets. Binghampton. Naval Training Device Center, Orlando, Fla.

—Plymouth Industrial Products, Sheboygan, Wis. $3,615,224. Stabilizing coated rods for 2.75mm rockets. Sheboygan. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Raber-Kief, Inc., and B-E-C-K Constructors, Seattle, Wash. $1,463,260. Construction of an Air Terminal Building and an Administration Building at the Naval Station, Adak, Alaska. Northwest Div., Bureau of Yards & Docks.

25 Curtiss-Wright Corp., Wright Aeronautical Div., Wood-Ridge, N.J. $1,103,300. Kits to support J65W16 engines for A-4B and F-1C aircraft. Wood-Ridge. Navy Aviation Supply Office, Philadelphia.

—Varo, Inc., Garland, Tex. $1,905,005. Guided missile launchers with power supplies for use on F-4 aircraft. Garland. Navy Purchasing Office, Washington, D.C.

—Arthur D. Little, Inc., Cambridge, Mass. $1,404,961. Technical consultation and engineering services in connection with sonar systems. Cambridge. Bureau of Ships.

—Willamette Iron & Steel Corp., Richmond, Calif. $1,221,412. Overhaul of the oiler USS Mattaponi (AO-41). Richmond. Industrial Manager, 12th Naval Dist.

—R. M. F., Inc., King of Prussia, Pa. $6,711,550. Nozzle and fin assemblies for 2.75mm rockets. Tampa, Fla. Navy Ships Parts Control Center, Mechanicsburg, Pa.

28 —Jess Howard Electric Co., Columbus, Ohio. $1,056,000. Paving and lighting of a runway shoulder at Bunker Hill AFB, Ind. Midwest Div., Bureau of Yards & Docks.

—Raytheon Co., Lexington, Mass. $2,023,158. Engineering and design services in connection with the SPARROW weapon system. Lexington. Bureau of Naval Weapons.

29 Garrett Corp., AiResearch Mfg. Co., Phoenix, Ariz. $2,241,000. T-76-G-8 engines for Air Force and Navy aircraft. Phoenix. Bureau of Naval Weapons.

—Raytheon Co., Lexington, Mass. $2,479,700. Guidance and control groups for Sidewinder missiles. Lowell, Mass. Bureau of Naval Weapons.

—Alpine Geophysical Associates, Inc., Norwood, N.J. $4,637,111. Conduct of a Marine Geophysical Survey Program. Norwood and in the Northwest Pacific Ocean. Naval Oceanographic Office, Suitland, Md.

30 Loral Corp., Bronx, N.Y. $1,000,000. Design, development and fabrication of test models of radio receiving equipment. Bronx. Bureau of Naval Weapons.

31 —Westinghouse Electric, Pittsburgh, Pa. has received six Bureau of Ships contracts totalling $19,464,676 broken down as follows: $1,060,901—designing and furnishing of reactor plant components for nuclear powered ships. $1,900,000—designing and furnishing of reactor plant components for nuclear powered ships. $4,901,260—reactor plant service equipment for nuclear powered ships. $1,639,400—design and furnishing of reactor plant components. $4,032,124—design and furnishing of reactor plant components. $4,034,000—continuation of research and development work in the field of naval nuclear propulsion. Work will be done in Pittsburgh.

—General Electric Co., Schenectady, N.Y. has received three contracts from the Bureau of Ships. $3,316,000—Research and development work in the naval nuclear propulsion field. $4,605,400—replacement of reactor plant components for naval nuclear powered ships. $1,865,600—Design and furnishing of reactor plant servicing equipment for naval nuclear powered ships. Work will be done in Schenectady.

—General Electric, Washington, D.C. $2,408,000. Design and development of the POSEIDON missile fire control subsystem and guidance subsystem support equipment. Pittsfield, Mass. Special Projects Office.

—United Aircraft, East Hartford, Conn. $1,282,275. Blades for J-75 engines. $2,694,337. Blade sets for J-57 engines. East Hartford. Navy Aviation Supply Office, Philadelphia.

—Atlas Tool & Die Corp., Paramount, Calif. $1,441,165. Steel pallets for arms storage. Paramount. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Northwest Marine Iron Works, Portland, Ore. $1,210,908. Modification of the missile range instrumentation ship RICH- [illegible] Portland. Industrial Manager, Eight Naval Dist.

—Commodyne Corp., Torrance, Calif. $1,195,637. Twelve liquid oxygen nitrogen generating plants. Torrance. U.S. Marine Corps.

AIR FORCE

1 Hughes Aircraft, Fullerton, Calif. $1,500,000. Technical studies on overland radar. Fullerton. Systems Engineering Group, Research & Technology Div. (AFSC), Wright-Patterson AFB, Ohio.

Westinghouse Electric Corp., Dayton, Ohio. $1,069,825. Production of generators for F-4 and F-5 aircraft. Dayton. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

1 General Electric, Cincinnati, Ohio. $2,151,550. Provisioning order for production of spare parts for J-79 aircraft engines. Cincinnati. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

General Electric, West Lynn, Mass. $4,000,000. Component improvement program for T-64 helicopter engines. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

North American Aviation, Anaheim, Calif. $7,189,072. Components for the improved MINUTEMAN guidance system. Anaheim. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

North American Aviation, Anaheim, Calif. $5,002,991. Production of depot maintenance equipment to support the MINUTEMAN missile program. Anaheim. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

United Aircraft, West Palm Beach, Fla. $2,000,000. Work on a development program for high performance rocket engines. West Palm Beach. Air Force Flight Test Center (AFSC), Edwards AFB, Calif.

General Motors, Indianapolis, Ind. $19,140,000. Production of T-56 engines for C-130 aircraft. Indianapolis. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

York Corp., York, Pa. $2,203,924. Design, fabrication and installation of environmental control systems for aircraft engine test facilities. Arnold Engineering Development Center (AFSC), Arnold AFS, Tenn.

4 General Motors, Indianapolis, Ind. $1,500,000. Work on a Phase I development program for a Direct Lift Engine. Indianapolis. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Cutler-Hammer, Inc., Deer Park, N.Y. $3,121,004. Spare parts for airborne reconnaissance systems. Deer Park. Warner Robins Air Materiel Area (AFLC), Wright-Patterson AFB, Ohio.

Raytheon Co., Bedford, Mass. $1,800,000. Work on an advanced airborne overland radar system. Bedford. Systems Engineering Group, Research & Technology Div. (AFSC), Wright-Patterson AFB, Ohio.

7 Lockheed Aircraft, Sunnyvale. $2,910,233. AGENA rocket launch services for 1966, Cocoa Beach, Fla. Space Systems Div. (AFSC), Los Angeles.

AVCO Corp., Stratford, Conn. $3,483,131. Production of T-53 helicopter engines for the Navy and Air Force. Stratford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

8 Westinghouse Electric, Baltimore, Md. $1,800,000. Work on overland radar. Baltimore. Systems Engineering Group, Research & Technology Div. (AFSC), Wright-Patterson AFB, Ohio.

Cleveland Pneumatic Tool Co., Cleveland, Ohio. $1,600,625. Production of landing gear components for KC-135 aircraft. Cleveland. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

Continental Aviation & Engineering Corp., Detroit. $1,191,910. Component improvement program for J-69 engine for T-37 aircraft. Detroit. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Kollsman Instrument Corp., Elmhurst, N.Y. $2,331,218. Production of aerospace ground equipment for mapping and survey systems. Elmhurst. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

9 General Electric, Syracuse, N.Y. $1,600,000. Support services for the Air Force and NASA programs at the Eastern and Western Test Ranges. Syracuse, N.Y., Vandenberg AFB, Calif. and Patrick AFB, Fla. Space Systems Div. (AFSC), Los Angeles.

Goodyear Aerospace Corp., Litchfield Park, Ariz. $1,299,447. Repair services for Army, Air Force and Navy airborne radar. Litchfield Park. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

A. J. Industries, El Monte, Calif. $8,003,436. Production of fuel tank assemblies for F 4C aircraft. El Monte. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

10 Fairchild Camera/Instrument Corp., Syosset, N.Y. $1,000,000. Production of aircraft cameras. Syosset. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Seattle, Wash. $2,120,000. T 50 engine improvement program. Seattle. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

General Electric, Cincinnati, Ohio. $11,098,600. Work on a propulsion system for high performance strategic aircraft. Cincinnati. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

United Aircraft, East Hartford, Conn. $11,098,000. Work on a propulsion system for high performance strategic aircraft. East Hartford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Collins Radio Co., Cedar Rapids, Iowa. $1,150,122. Production of communications equipment for RF 4C aircraft. Cedar Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

11 Kollsman Instrument Corp., Elmhurst, N.Y. $3,279,700. Production of aerospace ground equipment for mapping and survey systems. Elmhurst. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

United Aircraft, United Technology Center, Sunnyvale, Calif. $11,015,040. Production of ordnance items. Redwood City, Calif. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

Boeing Co., Seattle, Wash. $2,800,000. Research, development, test and engineering for modernization of Wings I through V of the MINUTEMAN weapon system. Seattle. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

14 United Aircraft, East Hartford, Conn. $1,064,316. Production of components for the J 57 aircraft. East Hartford. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

15 General Motors, AC Spark Plug Div., Milwaukee, Wis. $1,239,965. Research and development for the TITAN II inertial guidance system. Milwaukee. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Hughes Aircraft, Fullerton, Calif. $1,050,000. Study and design specifications for Tactical Air Control Centers. Fullerton. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

Electronic Communications, Inc., St. Petersburg, Fla. $1,880,830. Production of ground communications equipment. St. Petersburg. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

16 Bendix Corp., Teterboro, N.J. $3,404,125. Production of electronic equipment for C 141 aircraft. Teterboro. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

17 Hycon Mfg. Co., Monrovia, Calif. $3,499,025. Production of spare parts for aircraft camera systems. Monrovia. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

18 Boeing Co., Wichita, Kan. $3,550,000. Modification of B 52 bomb bays. Wichita. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

Collins Radio Co., Cedar Rapids, Iowa $1,355,600. Production of flight instruments for F 4, F 105 and F 106 aircraft. Cedar Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

21 Douglas Aircraft, Long Beach, Calif. $2,390,871. Production of bomb ejector racks for F 4 aircraft. Torrance, Calif. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

22 Cutler Hammer, Inc., Airborne Instruments Laboratory, Deer Park, N.Y. $2,500,000. Work on a flight test program for overland radar systems. Deer Park. Systems Engineering Group (AFSC), Wright-Patterson AFB, Ohio.

Honeywell, Inc., Hopkins, Minn. $1,929,345. Bomb production. Hopkins. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

23 Consolidated Diesel Electric Co., Stamford, Conn. $1,121,478. Production of ground generators and related equipment. Stockton, Calif. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

24 General Dynamics, San Diego, Calif. $1,136,698. Modification kits for F 102 aircraft external fuel tank assemblies. San Diego. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

Hazeltine Corp., Little Neck, N.Y. $1,260,000. Airborne radar systems. Little Neck. Systems Engineering Group (AFSC), Wright-Patterson AFB, Ohio.

Lear Siegler, Inc., Grand Rapids, Mich. $1,645,918. Procurement of aircraft gyroscopes and spare parts. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

25 Magnavox Co., Fort Wayne, Ind. $3,118,480. Production of aircraft communication sets. Fort Wayne. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

28 Hallicrafters Co., Chicago. $2,200,000. Production of components for electronic countermeasure systems. Chicago. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

30 Bendix Corp., Teterboro, N.J. $3,840,041. Production of aircraft navigational computers. Teterboro. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Lockheed Aircraft, Marietta, Ga. $1,022,644. Production of C 130 aircraft and related equipment. Marietta. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

31 TRW, Inc., Redondo Beach, Calif. $1,476,000. Work on a space program. Redondo Beach. Space Systems Div. (AFSC), Los Angeles.

Martin-Marietta, Baltimore, Md. $1,495,000. Modification of B 57 aircraft. Middle River, Md. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

Army Scientific Advisors

(Continued from Page 7)

General Manager, Institute of Electrical and Electronics Engineers, Inc.

Forward Area Air Defense Weapons.

Chairman: Dr. William C. Tinus, Vice President, Bell Telephone Laboratories.

Army Aircraft Research and Development.

Chairman: Mr. Charles H. Zimmerman, Chief Engineer, U.S. Army Materiel Command, (At time of study he was Director, Aeronautics Research, National Aeronautics and Space Administration).

Antitank Weapons.

Chairman: Mr. Richard S. Morse, Chairman, Cryonetics Corporation.

Scientific Personnel.

Chairman: Dr. John E. Vance, Professor of Chemistry, New York University.

Tactical Automatic Data Processing Systems.

Chairman: Dean William L. Everitt, College of Engineering, University of Illinois.

Target Acquisition.

Chairman: Dr. Finn J. Larsen, Deputy Director of Defense Research and Engineering (At time of study he was Vice President, Honeywell, Inc.).

Barrier Research.

Chairman: Major General Leslie E. Simon, U.S. Army (Retired).

Current ad hoc groups are conducting studies as follows:

Combat Vehicle Weapon System.

Chairman: Dr. William C. Tinus, Vice President, Bell Telephone Laboratories.

Tactical Air Defense.

Chairman: Professor Lawrence H. O'Neill, Associate Dean, School of Engineering and Applied Science, and Director, Electronics Research Laboratory, Columbia University.

Design Criteria, Future Armored Vehicles.

Chairman: Dr. Allen E. Puckett, Executive Vice President, Hughes Aircraft Co.

How well has the Army succeeded in utilizing its panel of scientific talent? This is answered in part by pointing to concrete accomplishments. Besides the three mentioned previously, there are other significant contributions for which ASAP ad hoc group studies are responsible. These include:

- The formation of The Army Research Council, which instituted major concept changes in the organization of Army Materiel Command laboratories.
- Continuation or termination of specific Army aircraft R&D projects.
- Procurement and test of automatic switching equipment for tactical communications.
- Enhancing effectiveness and prestige of scientific personnel in Army laboratories.
- Concepts for forward area air defense.

This is only a fractional list, and a partial testimony to the effectiveness of the Army Scientific Advisory Panel. The frequent requests for the counseling service of ASAP individuals further indicates the diversity of the panel's scope. These requests have included calls for assistance ranging from surveys by senior scientific personnel in stateside laboratories to ambush detection studies in Vietnam from environmental medicine in the tropics to communications in outer space.

Without exception, ASAP personnel have enthusiastically accepted these challenges. Though these are some of the nation's busiest men, they have willingly rearranged full schedules on short notice; they have attended meetings faithfully; many have worked on their own time to follow through on solutions to specific R&D problems. In short, they have placed their country's business first and the Army is fortunate and grateful for their generous service.

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Cost Information Reports Orientation Meetings Scheduled

The Department of Defense, in cooperation with the National Security Industrial Association, the Aerospace Industries Association and Electronic Industries Association, is sponsoring a series of orientation seminars on the Cost Information Reports (CIR).

Sessions will be open to Defense Department and industry executives and are designed to provide orientation as to which organizations will be responsible for completing CIR reporting requirements and using CIR data. Attendants will also be acquainted with the need for the CIR, the techniques of implementation and the expected use of CIR data.

A representative from the Office of the Secretary of Defense will be on hand at each presentation to answer questions. The sessions will be approximately three hours long. The first meeting was held in Washington, D.C., April 19.

Information can be obtained by contacting Jack E. Hobbs, Office of the Assistant Secretary of Defense (Comptroller), Room 3B857, The Pentagon, Washington, D.C., (Area Code 202) OXford 7-7514.

Requests for attendance should be sent no later than 10 days prior to the date of the orientation, and be accompanied by the name of the individual, company and address, and position or grade.

Exact addresses of the orientations will be given each registrant a week prior to the scheduled session. Attendance will be limited to 100 representatives (50 Government and 50 industry). Additional sessions will be scheduled in case of excessive requests for attendance.

Current schedule is as follows:

April 26	Dayton, Ohio	May 18	Washington, D.C.
May 2	Los Angeles, Calif.	May 19	Atlanta, Ga.
May 4	Seattle, Wash.	May 23	St. Louis, Mo.
May 9	St. Louis, Mo.	May 24	Dallas, Tex.
May 11	San Francisco, Calif.	June 1	St. Paul, Minn.
May 17	Boston, Mass.	June 2	Denver, Colo.

SAAMA Assigned C–5A Repair Mission

San Antonio Air Materiel Area (SAAMA), Kelly AFB, Tex., has been designated by the Air Force Logistics Command as the specialized repair activity (SRA) for the C-5A heavy transport aircraft.

As SRA for the newest Air Force weapon system, now entering the production stage, SAAMA will serve as the focal point for major overhaul work when the aircraft becomes operational in 1969. Colonel Harold Walker heads the new C-5A Section at SAAMA.

SAAMA was selected earlier as system support manager (SSM) for the giant carrier. The SSM is responsible for world-wide management of logistics support of the transport.

The latest assignment to SAAMA relates only to the airframe and airframe components. SRA for the aircraft's engines has not been named. Oklahoma City Air Materiel Area, Tinker AFB, Okla., is SSM for the engine.

The C-5A is being developed and will be produced by Lockheed-Georgia Co. at its Marietta, Ga., plant. Development and production of the engine will be performed by General Electric Co.

DEFENSE INDUSTRY BULLETIN

Volume 2, No. 5 — May 1966

C-1

IN THIS ISSUE

DEPARTMENTS

DEPARTMENT OF DEFENSE

PUBLICATION OF

ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

SUMMER JOBS FOR YOUTH

Last year at this time, employers throughout the country demonstrated what can be done to help the jobless youth of our country.

Through the 1965 Youth Opportunity Campaign, private employers, Federal, state and local governments averted a crucial youth unemployment problem by providing over one million extra summer work-training opportunities.

The challenge of the summer of 1966 now faces the nation. It is just as important and just as pressing as it was last year.

The statement of the President on the 1966 Youth Opportunity Campaign appears on page 1.

Army and Air Force Set Responsibilities on Fixed and Rotary Wing Aircraft

The responsibilities of the Army and the Air Force in the control and employment of certain types of fixed and rotary wing aircraft were set by the two Service in a joint decision released April 15.

The Army will transfer its CV-2 Caribou and CV-7 Buffalo aircraft to the Air Force and the Air Force will be in charge of all future intra-theater fixed-wing tactical airlift. Other types of fixed wing aircraft are not affected.

Also included in the joint decision was the announcement that the Army will be responsible for all rotary wing support for intra-theatre movement, fire support, supply and resupply of Army forces and those Air Force elements working with Army units to coordinate air support.

The Air Force will retain responsibility for rotary wing aircraft involved in Air Force search and rescue and special air warfare missions and Air Force rotary wing administrative support missions.

In cases of operational need, the joint or unified commander is authorized to attach the CV-2, CV-7 and CV-123 type aircraft to Army corps, division, or subordinate units in the field to perform supply, resupply, or troop-lift functions.

Both Services will continue to consult on the design of follow-on fixed wing aircraft to assure that the take-off, landing and load-carrying characteristics meet the needs of the Army for supply, resupply and troop-movement functions.

Joint Army/Air Force development of vertical take-off and landing aircraft (VTOL) will continue and the consideration of methods of employment and control of this type of aircraft will continue as the aircraft evolve.

Actions required by this agreement will be completed by Jan. 1, 1967.

Red Ball Express Again on the Move

The famed Red Ball Express of World War II, which saw an endless stream of GI trucks forming a mobile supply line between our troops in Europe and the seaports where supplies were landed, is once again on the move.

However, the method of transportation has changed from trucks to huge transport planes of the Military Airlift Command and the area of operations has been switched from Europe to Southeast Asia.

Despite these differences, the purpose remains the same—to get priority cargo where it is needed in the fastest possible time.

The 1966 version of the Red Ball Express, established by the Department of Defense last December, keeps vitally needed supplies moving rapidly from the west coast of the United States through the 5,000-mile supply route to Vietnam.

This has been made possible by the rapid transit methods of the Red Ball Express which allows a total time of 168 hours between the time a requisition is made in Vietnam until the arrival of the requested material.

Industry has helped to make the Red Ball Express program work by adopting accelerated techniques to meet deadlines. One Defense Supply Agency supply center reported that business firms accepted 253 telephoned orders and completed direct shipments on them to California. Of this number, 199 Red Ball Express requirements were filled on time within 48 hours and the remaining 54 within 72 hours.

DEFENSE INDUSTRY BULLETIN

Published by the Department of Defense

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Secretary of Defense

Hon. Cyrus R. Vance
Deputy Secretary of Defense

Hon. Arthur Sylvester
Assistant Secretary of Defense (Public Affairs)

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The *Defense Industry Bulletin* is published monthly by the Business & Labor Division, Directorate for Community Relations, Office of the Assistant Secretary of Defense (Public Affairs). Use of funds for printing this publication was approved by the Director of the Bureau of the Budget.

The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

Contents of the magazine may be reprinted freely without requesting permission. Mention of the source will be appreciated.

President Johnson Urges National Support of 1966 Youth Opportunity Campaign

The following is President's Johnson's statement relating to the 1966 Youth Opportunity Campaign:

In 1965, faced with the alarming prospect of hundreds of thousands of young Americans—16 through 21—looking for work in the summer and not finding it, this Administration launched a Youth Opportunity Campaign.

In 1966, we are faced with that prospect again.

In 1966, 1,800,000 of our youth will look for work in the summer without finding it.

Some of these youngsters will be looking for temporary summer jobs. But getting those jobs may be the difference between being able to go back to school or not going back.

Almost a million of them will be trying to find their places in life, trying to become independent, self-sufficient.

If we fail them, it will mean that we are failing our future.

• It will mean that one out of every six white 16- through 21-year olds looking for work won't find it.

• It will mean that one out of every five non-white youths looking for work will not find it.

• Finally, it will mean that we have allowed our youth who will represent 14.3 percent of our country's summer work force to become 50 percent of our summer unemployed.

Last month, I asked the Vice President to chair a Task Force on Summer Domestic Programs. Their recommendations included one that there be a 1966 Youth Opportunity Campaign.

I accept that recommendation.

In 1965, a concerted effort, particularly by private employers large and small, produced a million jobs for our young people. Our country again proved its ability to respond to a serious situation.

In 1966, we can, in my judgment, increase by at least a million the work and training opportunities this summer for our boys and girls—in a way that is good for them and good business for all of us.

The Private Employer's Role.

I hope and believe that private employers, who were largely responsible for our 1965 success, will exceed that success in 1966.

• There are 620,000 firms in this country which employ from 10 to 100 workers. I hope that at least half of these firms will agree to take on one extra summer trainee.

• There are 60,000 larger plants employing over 25 million people. If each of them will add one extra summer trainee for each 100 employees, this will mean another 250,000 trainees.

I hope other large organizations—labor unions, trade associations, churches, colleges—will make a similar effort. This could mean another 25,000 to 50,000 trainees.

So this program can get started immediately, I am asking that these things be done:

• That all private employers who are disposed to do so make their own arrangements immediately for taking on one or more extra trainees this summer.

• If advice of this action, including the name of the trainee, is given by mail to the Secretary of Commerce, Youth Opportunity Campaign Unit, Washington, D.C., it will be appropriately acknowledged.

• That all other private employers and organizations who are willing to cooperate in this program so advise the nearest State Employment Office.

• That all State Employment Offices be advised, through the U.S. Employment Service, to establish special Youth Opportunity registers for this special summer program.

• That all boys and girls 16 through 21 who want to work this summer and who don't have jobs get in touch immediately with the nearest Employment Service Office. If this is difficult, write to the Department of Labor, Youth Opportunity Campaign Unit, Washington, D.C.

The Federal Government's Role.

I expect the Federal Government to do its share.

I am again directing the Government departments and agencies to make every effort to find meaningful work or training opportunities this summer for one extra trainee for every 100 employees on their present payrolls.

• This is to be done, for the most part, in the field offices and installations around the country.

• These opportunities will be given, so far as this is practicable, to boys and girls 16 through 21 who need them the most because of economic or educational disadvantages.

• There is a potential employment here of 25,000 trainees.

• Programs under the Vocational Education Act will be expanded from last year's 7,500 students to 26,000 students this summer.

• The Work-Study program originally planned to provide opportunity for 76,000 students in over 1,400 communities will be expanded to assist 100,000 more.

• I am asking that activity under the Manpower Development and Training Act be immediately intensified to provide training opportunities for at least 80,000 youth.

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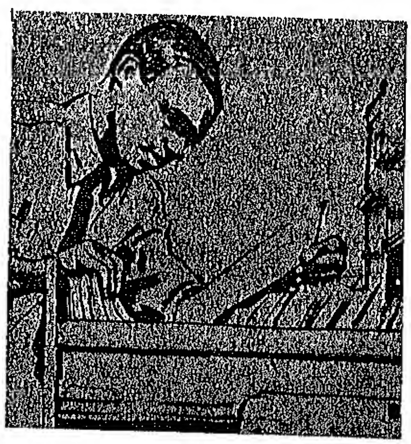


Found: A Practical Configuration Management System

by
Charles Borum
Chief, Configuration Management, Pershing Project Office
U.S. Army Missile Command, Redstone Arsenal, Ala.

The development of practical configuration management systems has become increasingly important to the U.S. Army in the control and management of complex weapon development. Compressed R&D programs and world-wide equipment deployment demand the timely identification, control and accounting of equipment configuration prior to delivery and during field use.

During early production of the Army's Pershing missile system, a problem which has long faced weapon developers cropped up: with increasing quantities of equipment going to the field from the manufacturer and with many subcontractors building items which ultimately found their way into the system, it was imperative that all equipment be delivered in strict conformance with engineering drawing requirements. Furthermore, it was necessary that any design changes be uniformly incorporated into hardware prior to delivery, unless specifically planned for later field installation. A hit-and-miss procedure could play hob with a subsequent field modification program. Compounding the problem was the fact that, on Pershing, R&D and early production schedules overlapped.

The Pershing Project Manager's Office at the Army Missile Command, Redstone Arsenal, Ala., went to work on the knotty problem with the cooperation of Martin Company's Orlando (Fla.) Division, prime contractor. The solution they came up with in October 1963, particularly in the realm of configuration accounting techniques, has proven extremely effective and is felt to offer significant improvement over other methods in use.

The system affected both in-house and breakout contractor efforts. Although many aspects of the program are new in concept, considerable attention has been given to integrating the management and control functions in a manner consistent with currently established Army lines of communication.

The Pershing application concerns a complex weapon system. However, the basic building blocks are adaptable to most levels of weapons management. Since most of the techniques of configuration identification and control are relatively standard within the Army (Figure 1), this article will be limited to a description of configuration accounting techniques utilized in the Pershing program.

The purpose of the configuration accounting program is to provide accurate configuration definition and information retrieval for items of equipment through all phases of design, development, production and operational service life. The accurate and timely availability of such information is a management tool in addition to the obvious technical benefits provided. In conjunction with a controlled field modification program, the availability of equipment for its tactical mission is not jeopardized because of configuration incompatibilities.

Basic elements of the computer mechanized system are baseline control, change accountability and configuration records.

Baseline Control. With increased emphasis on fixed price contracting, the requirement for configuration definition has become a necessity. Identification of all elements of the technical data package describing the items must be detailed, including the appropriate change levels. During the performance under the contract all necessary changes must be identified as supplemental to the contract definition and appropriate certification established to assure their incorporation prior to equipment delivery. In order for a field modification program to be effective, equipment must be delivered in strict conformance with previously planned configuration requirements. The Pershing system identifies the contract configuration and authorizes changes and certification of accomplishment prior to Government acceptance of the equipment.

Change Accountability. The change accountability tab run (Figure 2) requires a manufacturing work area to accomplish an authorized change. The requirement details the part number affected, equipment item and effectivity and appropriate change level to be incorporated. Updated and issued daily to affected work areas, the tab run shows each outstanding change action. A requirement remains open until certified by Quality and Army Ordnance Inspection, through the use of a Configuration Accountability Transmittal Card (Figure 3), that the work has been accomplished. The completed transaction is then stored in computer memory until prior to delivery when "as-built" information is required for configuration records. In addition, as serialized items are installed in higher level assemblies, completion accountability transmittals are forwarded to Configuration Management to show actual configuration and serial numbers of lower level items installed in major equipment.

Configuration Identification	Configuration Control	Configuration Accounting
Specifications	Change Review and Planning	Baseline Control
Drawings	Change Authorization	Mechanized Change Accountability (Prime Contractor)
Documentation Policy and Procedures	Systems Change Board	Mechanized Configuration Record (Prime and Breakout Contractors)
Serialization—Traceability		Mechanized Field Configuration Record
Quality Assurance Provisions		Configuration Accountability Transmittals
Special Acceptance Inspection Equipment		
Packaging Data Sheets		

Figure 1.

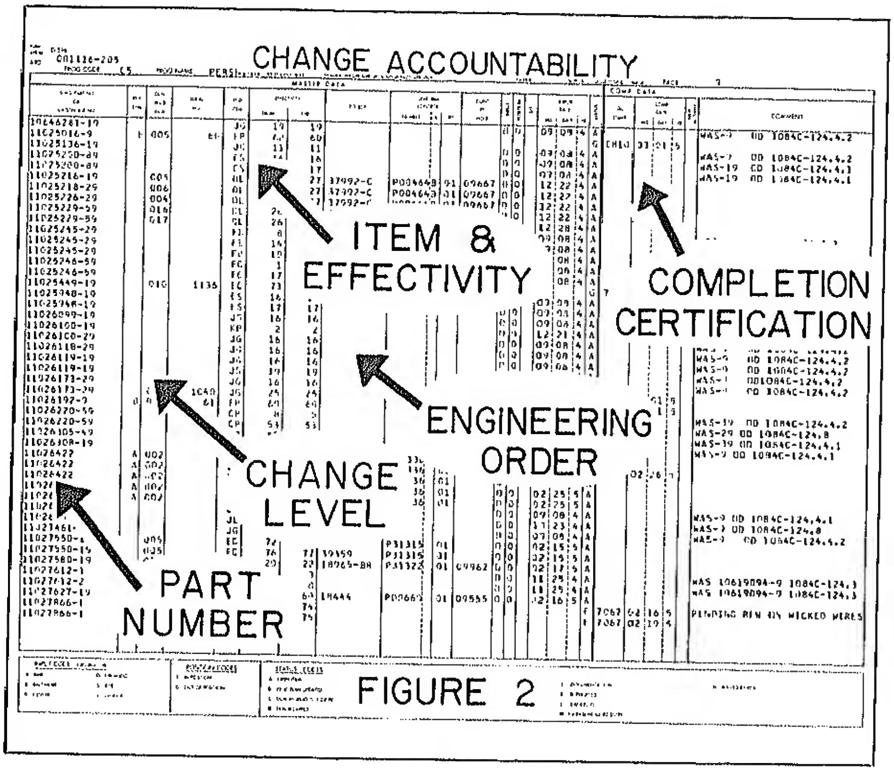
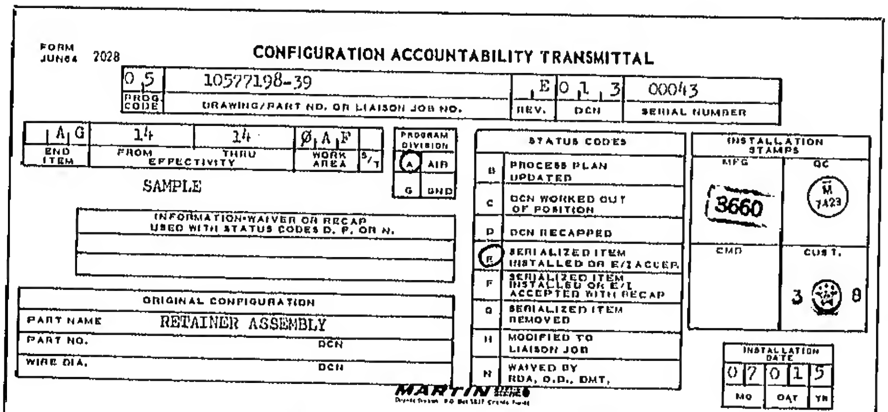
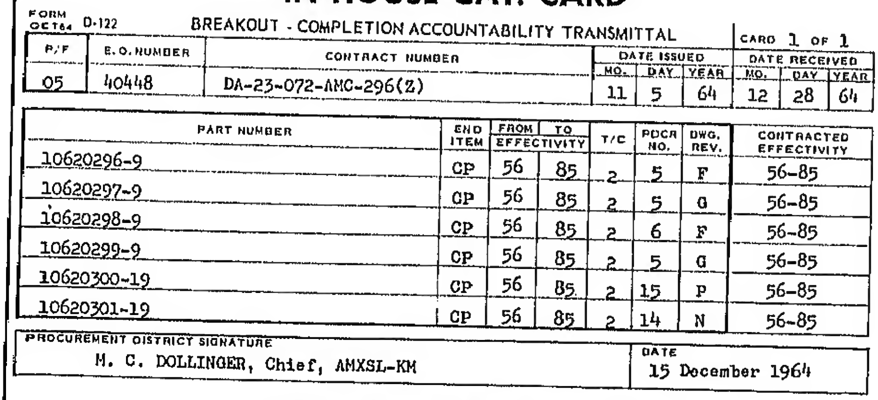


FIGURE 2



IN HOUSE CAT. CARD



BREAKOUT CAT. CARD

Figure 3.

Configuration Records. Configuration records define the engineering requirements and certify that equipment has been built to the proper contract and engineering definition. An example of a configuration record utilized for initial delivery of equipment is shown in Figure 4 (see inside back cover). The "as-engineered" portion of the record details the part numbers, quantities, effectivity, contract baseline and required change level. The as-built portion of the record details the actual fabricated configuration, including the incorporation of changes released subsequent to contract baselining and the serial numbers of lower level items installed in major equipment. As-built certification is accomplished through a Configuration Accountability Transmittal (CAT. Card) as shown in Figure 4. This is completed by the contractor's manufacturing organization and certified by Quality Assurance and Procurement Inspection personnel.

Breakout Configuration Records. Breakout contracting presented a significant management problem in that the prime contractor originated Engineering Change Packages affecting equipment fabricated in another section of the country by a breakout contractor. For this purpose the basic configuration record system was further refined to a Breakout Configuration Record system. In general, a breakout contract definition is substituted for the as-built portion of the basic configuration record. Thus, the exact difference between the technical definition of the equipment at the prime contractor and the breakout contract definition is apparent at all times. In order to assure that changes released by the prime contractor are incorporated into the breakout contract, the Configuration Accountability Transmittal (Figure 3) is forwarded to the cognizant Army Procurement District with the Engineering Change Package. When the change is negotiated into the breakout contract, the Procurement District notes the negotiated effectivity and forwards the card back to the prime contractor to update the breakout configuration record. In the event that the negotiated effectivity differs from that documented and requested, then appropriate action (re-engineering, etc.) can be accomplished early enough in the program to avoid equipment and field modifi-

(*Continued Inside Back Cover*)

Safeguarding Nuclear Superiority

by
Col. Ralph S. Garman, USAF

Of all the Free World responsibilities the United States has assumed since 1945, none has been of more importance than the nuclear deterrence to all-out war.

Today, more than 20 years since the atomic age began, nuclear deterrence continues to provide the shield behind which free men can work and build for peace.

The success of our nuclear deterrence has resulted from an unfaltering national will to preserve peace and deny victory to any aggressor. It has also resulted from a dynamic, imaginative, well-supported technology which has provided weapons and knowledge to give the United States unquestioned superiority in nuclear firepower.

In spite of the restrictions imposed by the limited nuclear test ban treaty, which requires that testing can be conducted only underground, the Department of Defense, Atomic Energy Commission and industry have continued to upgrade weapons capabilities, to improve the survivability of weapon systems, and to advance nuclear know-how on many fronts.

The Air Force Special Weapons Center, which is a part of the Air Force Systems Command, is a long-time member of the military-civilian team charged with applying advancing nuclear technology to national security needs.

Located at Kirtland AFB, Albuquerque, N.M., the Special Weapons Center is a next-door neighbor to the Defense Atomic Support Agency's Field Command, the Atomic Energy Commission's Albuquerque Operations Office, and Sandia Corp., an AEC prime weapons contractor. The Los Alamos Scientific Laboratory is about 70 miles to the north.

The Special Weapons Center has a hand in supporting all of the national safeguards under the nuclear test ban treaty. Briefly, the safeguards require:

- The conduct of underground nuclear weapons test programs.
- Maintenance of modern nuclear lab facilities and programs.
- Maintenance of facilities and resources necessary to initiate prompt nuclear tests in the atmosphere and other environments should they ever be required.
- Improvements of the capability to monitor the terms of the treaty and to detect violations.

When Secretary of Defense Robert S. McNamara testified in favor of the test ban treaty before the Senate Foreign Relations Committee in the summer of 1963, he promised that the United States would maintain the vitality of our weapons laboratories, would continue to conduct a program of underground tests, and would retain the administrative talent and other resources required for quick expansion of the test program into additional environments.[1]

Each one of these promises has been kept.

It is firm national policy to retain a readiness-to-test capability in every relevant environment, and to support a dynamic technology in weaponry, nuclear effects research, systems survivability, and test detection and analysis. It is also national policy to make certain that we maintain what Secretary McNamara has called "a

[1] *Secretary of Defense McNamara's statement upholding the nuclear test ban treaty, Aug. 13, 1963, Senate Foreign Relations Committee.*

Col. Ralph S. Garman, USAF, is the Commander of the Air Force Special Weapons Center of the Air Force Systems Command. Prior to this assignment, he commanded the Air Force Missile Development Center. An Air War College graduate, his research and development career dates back to the 1940's when he was involved in the experimental development of fighters and research aircraft.

strong deterrent to abrogation" of th test ban treaty and, through all avai able means, to render the risk c abrogation minimal.[2]

An important part of the U.S capability to resume atmospheri testing on short notice is based o an airborne diagnostic technique firs successfully demonstrated during th later phases of Operation Dominic our last series of in-the-air tests con ducted in 1962.[3] This technique—which frees atmospheric testing fron land-based instrumentation—resulted from the Special Weapons Center's development of extremely accurat airborne distance measuring equip ment which made it possible to per form diagnostics of atmospheric tests from an airborne array without ground support. This development provides a simultaneous, slant range measurement of distances between all aircraft in the test array and the nuclear device, as well as the distance between aircraft.

Heart of the test array consists of Special Weapons Center B-52 drop aircraft and three NC-135 diagnostic aircraft flown by the center and instrumented by the Atomic Energy Commission's three weapons laboratories — Los Alamos, Sandia and Lawrence.

In the autumns of 1964 and 1965, full-scale exercises were successfully conducted in the Pacific by the Defense Atomic Support Agency's Joint Task Force Eight to proof-test the airborne diagnostic capability and to provide realistic training for some 1,500 Defense Department, Atomic Energy Commission and contractor personnel.

The exercises involved dropping instrumented test simulation objects from the B-52's while the three NC-135's simulated gathering nuclear diagnostic data.

In addition to planning for Air Force support of resumed atmospheric tests and maintaining the basic air array for nuclear test readiness, the Special Weapons Center provides air support of underground tests of nuclear weapons and detection techniques. It maintains a detachment in Nevada which furnishes and coordinates all atomic test site aerial activities there.

The center furnished airborne support of the 1965 underground detonation on Amchitka Island in the Aleutians which helped scientists in their

[2] *Ibid.*
[3] *AEC Annual Report to Congress for 1964, p. 71.*

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The Defense Communications Satellite Program

by
Lt. Gen. Alfred D. Starbird, USA
Director, Defense Communications Agency

The Defense Department has been heavily engaged for several years in activities related to a satellite communications system. The Department expects to realize an initial limited satellite communications capability in the very near future with the Initial Defense Communications Satellite System.

DOD has certain unique requirements which can best be met by a satellite communications system. As early as 1958, the Defense Department's first experiment in satellite communications was made with the launching of Score by the Army Signal Research and Development Laboratory. Sent into orbit by the Air Force in December of that year, this satellite had a life of 12 days but in that time demonstrated real time relay of voice, code and teletype messages. In 1960 the Army and the Air Force collaborated again to put up Courier, a rather complex experiment. During its 18-day life, Courier received and re-transmitted 118,000,000 words.

In 1960 the Secretary of Defense combined all DOD satellite communications efforts under the U.S. Army Advent Management Agency. However, by 1962, it was found that the Advent concept of a large synchronous satellite launched by the proposed Centaur booster stretched the state of the art. The project was wisely cancelled.

The efforts of NASA with the Relay series and the Bell System with the Telstar series has further increased DOD confidence in achieving satellite communications for military usage. In 1962, the Secretary of Defense established the Defense Communications Satellite Program (DCSP) and assigned to the Defense Communications Agency the responsibility for integration of its ground and space efforts.

By October 1964, DCSP project definition studies were completed with the proposal for a medium altitude, random, polar orbit system with the Atlas/Agena booster. Each booster was to place seven satellites in orbit and there were to be four launchings.

The military has peculiar stringent demands for survivability, reliability, flexibility and ability to move rapidly into remote areas. Its requirement is for a limited number of circuits to reach any point, but assured ones.

As the Communications Satellite Corporation was being established and as its organization evolved, however, it became apparent that the capability of the ComSat Corporation to provide national security communications should be investigated. After extensive discussions and joint studies with the ComSat Corporation from October 1963 to July 15, 1964, the Secretary of Defense concluded that the DOD must proceed with its own system to meet certain DOD needs.

During the period of study, the Titan III-C program had developed to a point where certain scheduled development launches could be used to launch DOD R&D satellites. Studies indicated that, for the initial research and development system, DOD could use Titan III-C to carry eight satellites into circular orbit in an equatorial plane at near-synchronous altitudes. Consequently, DOD decided to establish its initial defense communications satellites in a random equatorial pattern at an altitude of 18,250 miles.

By this time, also, DOD had established the satellite as a 32-inch polyhedron, with 32 watts of silicon solar cell power, receiving in the 8,000 megacycle and transmitting in the 7,000 megacycle bands. The satellite would radiate approximately three watts in a toroidal pattern and would have no control system.

Three Titan III-C launches in early 1966 are planned, each carrying up to eight satellites to a near-synchronous altitude. Each satellite will be dispensed at a different velocity which will cause separation at rates of four degrees per day. Satellites will be spin stabilized at 150 RPM. A mean-time-before-failure of one and one-half years or better is expected.

Transportable ground terminals employing 40-foot parabolic antennas are now being deployed to sites around the world. Our older 60-foot terminals at Fort Dix, N.J., and Camp Roberts, Calif., are being readied. Late this year a smaller transportable terminal will be added—one capable of very rapid installation and use in contingency/crisis situations.

During the initial DCSP development, invaluable experience was gained participating with NASA in the Syncom project. NASA orbited Syncoms II and III. They are now stationed at 70° East and 165° East Longitude, respectively. DOD pro-

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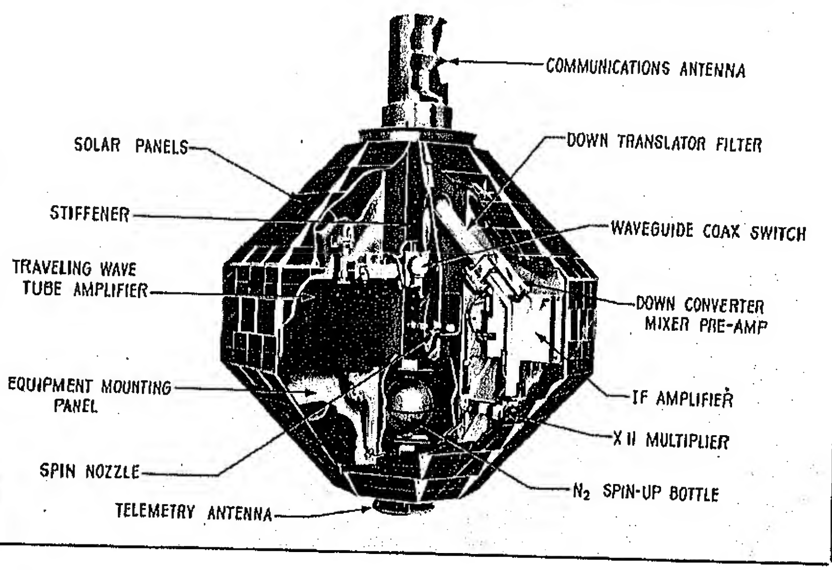
SPIN STABILIZED COMMUNICATIONS SATELLITE



DEPARTMENT OF DEFENSE

Lt Gen. Andrew J. Goodpaster, USA, has been named to relieve Lt. Gen. David A. Burchinal, USAF, as Dir. of the Joint Staff, Joint Chiefs of Staff.

Frederick S. Wyle has been sworn in as Dep. Asst. Secretary for Policy Planning in the Office of the Asst. Secretary of Defense (International Security Affairs).

Two changes took place in the Office of the Asst. Secretary of Defense (Comptroller) in April. Joseph S. Hoover was sworn in on April 20 as Principal Dep. Asst. Secretary and George W. Berquist assumed the position of Dep. Asst. Secretary of Defense (Management Systems Development) on April 15.

Effective July 1, 1966, Maj. Gen. Arthur W. Oberbeck, USA, will take command of Joint Task Force Eight, a subordinate command of the Defense Atomic Support Agency. He will succeed Maj. Gen. John D. Stevenson, USAF.

Dr. Stephen J. Lukasik has been appointed Dir. of Nuclear Test Detection for the Advanced Research Projects Agency.

Maj. Gen. James C. Sherrill, USAF, has been assigned to duty as Special Asst. for Strategic Mobility with the Joint Chiefs of Staff.

Brig. Gen. Paul W. Tibbets, Jr., USAF, has been named Dep. Commander for Management and Systems, Military Traffic Management and Terminal Service.

RAdm. Winston H. Schleeff, USN, will take command of the Defense Fuel Supply Center, Alexandria, Va., in June. He succeeds Lt. Gen. W. O. Senter, USAF, who is retiring.

Col. Thomas L. Fisher, USAF, has been reassigned as Asst. to the Dir., Policy Planning Staff, Office of the Asst. Secretary of Defense (International Security Affairs).

Capt. G. C. Heffner, USN, has been designated as Inspector General for the Defense Supply Agency, Alexandria, Va. He will assume the position in July succeeding Col. Talbert I. Martin, USA, who will become Commander, Defense Depot, Memphis, Tenn.

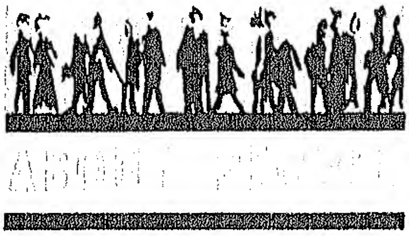
Two Defense Contract Administration Services Regions have new directors. Col. Loren P. Murray, USAF, succeeds Capt. Richard D. White, USN, at Atlanta, Ga., and Capt. W. Glenn Normile, USN, succeeds Col. Charles F. Burley, USAF, at Dallas, Tex.

DEPARTMENT OF THE ARMY

Maj. Gen. William C. Gribble, became Dep. Chief of Research and Development, at Hq., Department of the Army, in April.

Command of the Desert Test Center, Salt Lake City, Utah, was assumed by Brig. Gen. John J. Hayes in another change last month.

Brig. Gen. Richard H. Free has been assigned to duty as Dep. Dir., Research and Development, Army Materiel Command, effective June 1.



Col. William M. Mantz has assumed command of the Army Natick Laboratories in Massachusetts. Col. Mantz, who comes to the assignment from duty as Commanding Officer, Support Command, Alaska, has also been nominated for promotion to brigadier general.

Col. Miles L. Wuchendorf will succeed Col. Curtis W. Chapman, Jr., as Executive to the Army Chief of Engineers, Washington, D.C., Aug. 15.

Lt. Col. Harold W. Yount, Project Manager for Rifles at Headquarters, Army Weapons Command, Rock Island, Ill., has been promoted to colonel.

Lt. Col. William J. McClain has been assigned to the Army Missile Support Command as Provost Marshal for Redstone Arsenal, Ala.

Lt. Col. Harold E. Shaw has been named Commander, Army Nuclear Defense Laboratory, Edgewood Arsenal, Md. Edwin H. Bouton was named acting Technical Director of the Nuclear Defense Lab.

DEPARTMENT OF THE NAVY

George V. Shaefer has been named to head the U.S. Naval Oceanographic Office's West Coast Detachment which will be located at Point Loma, Calif. The new detachment will act as liaison between Government agencies, non-Government scientific activities and the Naval Oceanographic headquarters in Washington, D.C., in addition to its regular technical and scientific support mission.

RAdm. Frank C. Jones will be relieved in July by Capt. Stuart C. Jones, as Commander, Boston Naval Shipyard. The new commander is now serving as Production Officer, Charleston Naval Shipyard.

Brig. Gen. Frank E. Garretson has been named Marine Corps Director of Information. Gen. Garretson takes over from Col. Paul M. Moriarty, who has been interim Director of Information since the detachment of Brig. Gen. A. H. Adams last February. Col. Moriarty will be Gen. Garretson's deputy.

DEPARTMENT OF THE AIR FORCE

The following named officers will be retired in the grade of general on dates indicated:

Gen. Bernard A. Schriever, Commander, Air Force Systems Command, Aug. 31.

Gen. Robert M. Lee, Air Dep. to Supreme Allied Commander, Europe, July 31.

Gen. Jacob E. Smart, Dep. Commander in Chief, U.S. European Command, July 31.

The following three officers have been nominated for promotion to general and named to replace the above retiring officers on indicated dates.

Lt. Gen. William S. Stone, Air Dep. to Supreme Allied Commander, Europe, Sept. 1.

Lt. Gen. James Ferguson, Commander, Air Force Systems Command, Sept. 1.

Lt. Gen. David A. Burchinal, Dep. Commander in Chief, U.S. European Command, Aug. 1.

Maj. Gen. Leighton I. Davis, has been assigned as Dep. Commander, Air Force Systems Command, for Global Range.

Brig. Gen. Charles H. Roadman is the new Commander of the Aerospace Medical Div., AFSC, Brooks AFB, Tex. He relieves Brig. Gen. Thomas H. Crouch.

Col. Gilbert L. Curtis has been assigned as Commander of the 2848th Air Base Group, Air Force Logistics Command, Norton AFB, Calif.

Col. David H. Barger has been named Dir., Gemini Support, Air Force Systems Command, with offices in the Federal Office Building, Washington, D.C.

Col. William F. Dolby has been named Dir., Civil Engineering, AFSC, Air Force Western Test Range, Vandenberg AFB, Calif.

Col. John T. Ely, has been reassigned as Asst. Dep. for Radiation Warfare Support, Foreign Technology Div., AFSC, Wright-Patterson AFB, Ohio.

The new Dir., Research Programs, Office of Aerospace Research, is Col. Robert E. Smith.

Navy Collocates Oceanographic R & D Groups

Three Navy technological groups have been collocated at the Naval Research Laboratory (NRL), Washington, D. C., to coordinate their oceanographic programs.

Involved in the move were NRL's newly formed Ocean Science and Technology Group, the NRL Ocean Science and Engineering Division and the Research and Development Department of the Naval Oceanographic Office.

Although the three groups will be working together, they will each remain under technical supervision of their own research director.

The venture will provide increased efficiency in oceanographic research due to the excellent laboratory facilities available at the Naval Research Laboratory and closer working ties.

Dr. J. Brackett Hersey, who has accepted appointment as Special Assistant for Oceanography to the Assistant Secretary of the Navy (Research and Development), will be the director of the oceanographic group.

Project Management Review: A Concept

by

George W. Bergquist

The concept of project management continues to flourish in the Navy Department. Since the creation of the Naval Material Support Establishment (NMSE) in December 1963, which placed the Navy Material Bureaus under one head, i.e., the Chief of Naval Material, 27 efforts have been designated for exceptional or "project" management. This includes nine projects whose managers report to the Chief of Naval Material and 18 projects whose managers report to the material bureau chiefs. Priorities, size, complexity, interface relationships and relative importance generally determine to whom the project manager will report.

By reason of the increased implementation of project management within the Naval Material Support Establishment, Vice Admiral I. J. Galantin, the Chief of Naval Material, is taking steps to assure himself that the disciplines, procedures and methods of project management are vigorously exercised. For example, two pilot tests have recently been completed of a procedure which has been called "Project Management Review." This concept consists of the designation of a team, called the Project Management Review Team, whose assignment is primarily to inquire into the effectiveness of the management of a project. Additionally, the team inquires into the degree to which the project's program objectives have been accomplished. Incident to the latter, observations will be made by the team as to when a project ought to be phased down or disestablished.

The two pilot tests have been so successful that Admiral Galantin has made the decision to implement this concept on a permanent basis. Implementing instructions, at the time of this writing, have been prepared and are in the process of approval and distribution. Implementation and administration of the project review procedure have been assigned to the Plans Division, Project Management Branch (Code MAT 111), Office of Naval Material, Navy Department, Washington, D.C.

The ultimate success of the reviews is recognized to be substantially dependent on the experience, knowledge and objectivity of the team. For this reason careful attention will be paid to the qualifications of persons designated as Project Management Review Team members. Implementing instructions assure that the Project Management Branch, Plans Division, Office of Naval Material, provides permanent team leadership and has at least one member on each review team. This organization specializes in the implementation of the concepts and policies of project management throughout the total Naval Material Support Establishment. Its members are graduates of the Defense Weapons System Management Course, a three-month Department of Defense course in project management given at Wright-Patterson AFB, Ohio. Members, in many instances, have had substantial, actual experience in project management organizations. Functional specialists from other organizations of the Office of Naval Material may be called on to serve either as full- or part-time members of the Project Management Review Team, depending on the size of the project, its complexity and the type of problems anticipated. The project manager is expected to designate one individual from his staff to act as a central point of contact during the reviews. The project manager himself is encouraged to participate to the maximum degree possible.

Mr. George W. Bergquist is the newly appointed Dep. Asst. Secretary of Defense (Management Systems Development). At the time this article was written he was Dep. Chief of Naval Material for Programs and Financial Management. Mr. Bergquist is a graduate of Harvard University and has a Masters Degree in Public Administration.

To ensure the adequacy of reviews, a check list has been devised for use by the review team. Also, a questionnaire is forwarded to the project manager in advance of the review to which he is expected to respond. The major divisions of the check list are:

- Authority and responsibility of the project manager.
- Project charter.
- Program identification.
- Project priority.
- Dollar size and complexity.
- Qualification for project management.
- Project history.
- Project visibility.
- Project staffing.
- Communications channels.
- Reporting.
- Project status reviews and evaluation.
- Management information systems.
- Financial management.
- Planning.
- Technical direction and implementation of DOD directives.

Each of the foregoing major divisions is subdivided so that there are approximately 150 specific questions in the check list.

The questionnaire requires the project manager to respond to about 18 questions on control, authority and responsibility. Additional information is required concerning the support that the project manager receives from material bureaus and Naval field activities.

The intent is to conduct the reviews with the least possible disruption to the operations of the project organization. At the conclusion of the review, the team presents its independent findings, conclusions and recommendations to the project managers, the Chief of Naval Material, and, if the project reviewed is at the bureau level, the chief of the bureau to whom the project manager reports. The project manager may or may not concur with the findings of the team. If he does not, his reasons may be stated during briefings. Insofar as possible, the team is expected to resolve controversial areas before the final briefing to top management.

The findings, conclusions and rec-

ommendations of the review team are formalized in a final report to which the project manager may attach an addendum if he chooses to nonconcur with any of the conclusions or recommendations of the team.

It is planned to make wide distribution of the findings of each review. Cross-fertilization of ideas is a primary objective, and this cross-fertilization is expected to contribute substantially to the overall understanding of project management concepts, policies, procedures and problems throughout the NMSE.

The Instrumentation Ships Project (PM-5), under Captain A. F. Hancock, USN, was the first project selected for pilot test of the concept. It was chosen for its relatively small size and also because of its dependence on the Bureau of Ships to provide support in areas such as procurement, engineering services and administrative matters.

The project had been established at the direction of DOD as part of the objective to centralize the management of all DOD activities in support of the National Range Program. PM-5, though small, is complex, since its business is conducted with agencies outside the Navy, principally with the range activities of the Air Force and the National Aeronautics and Space Administration (NASA). The assignment of the project manager is to fulfill the Navy's responsibility for the construction, conversion and modification of all general purpose instrumentation ships in support of DOD and NASA world-wide tracking requirements. This includes the instrumentation ships in support of NASA's Apollo Program.

The results of the Project Management Review of the Instrumentation Ships (PM-5) Project are considered to be both significant and useful. For example, the review served to confirm:

• That the concept of using existing Navy bureaus to support the project is sound.

• The need for the project manager's careful execution of formal, explicit, interface agreements when two or more DOD components and outside agencies are engaged in related work.

• The fact that the Project Management Review provides the project manager with an incentive to identify his "managerial" problems and, to bring them to the attention of higher authority if such assistance is needed.

• The need for "closed-loop" communications between the project manager and those to whom he is responsible.

In addition to the four major conclusions above, a number of specific administrative and procedural areas for improvement were identified, and corrective action has been taken.

Recognizing the rather unique character of the Instrumentation Ships Project, the decision was made to test the concept further by applying it to a more conventional all-Navy project. Accordingly, the next project selected for review was the All-Weather Carrier Landing System Project (PM-6) under Captain F. R. Fearnow, USN. This project has for its objective the development of an all-weather aircraft/carrier landing system oriented toward fixed wing aircraft.

Again, the proposed check list and project manager's questionnaire were applied to this project. As in the case of the review of the Instrumentation Ships Project, the check list and questionnaire proved to be useful guides in ensuring the desired coverage. At the completion of the review some significant observations were made, principally bearing on the importance of control of funds and contracting, for successful project management.

Project managers have, in general, welcomed the idea of the reviews. For example, one project manager commented that the check list would provide him with a helpful self check.

There will be no contacts with industry during the reviews. The reviewers will, however, be inquiring into areas relating to the project manager's administration of contracts with industry, the kinds and frequency of reporting required of industry and other related factors. It is conceivable that the concept could be extended to include occasional visits to contractors' plants but this is not planned at present.

The current schedule calls for six additional reviews to be conducted during this calendar year.

Experience to date has demonstrated that the project review concept is a useful and effective management tool from the standpoint of top Navy management as well as the individual project manager.

Defense Communications Satellite Programs

(Continued from Page 5)

vided the ground terminals now emplaced in Hawaii, the Philippines, Saigon and Asmara, Eritrea. A terminal was installed aboard the USNS Kingsport. Beginning with NASA's Gemini 3, this station has provided valuable service in relaying communications from ocean sites through Syncom to satellite ground terminals in the Pacific, and thence by conventional means to the NASA Manned Space Flight Center in Houston. Six-foot antenna terminals were installed aboard two of the Navy's combatant ships.

NASA, having completed its experimental tests, has transferred operational responsibility of the Syncoms to the DOD. Conduct of operational testing is continuing, with availability also for emergency operational use in the Pacific and Indian Ocean areas.

The Defense Department, with the cooperation of the ComSat Corporation, conducted tests over Early Bird and found that it provided reliable and high quality service, limited only by the effect which long transmission times have on certain error detection and correction techniques. National policy, as expressed by the President in his annual report to Congress, Feb. 15, 1965, indicates the Government will limit its DCSP to a capacity necessary to handle "unique and vital national security needs." DOD will use "commercial satellites and other common carrier communications systems for the transmission of the bulk of its (DOD) traffic between the United States and various overseas areas." Therefore, DOD is closely following ComSat plans.

In July 1965, NASA requested the manager of the National Communications System to determine Intelsat's capability to provide communications in support of the Apollo manned flights from certain land and ship locations. The Intelsat proposal for two satellites over the Pacific and Atlantic Oceans has been tentatively accepted. NASA is now negotiating with the ComSat Corporation as manager for Intelsat, for provision of service in late 1966.

Meanwhile, DOD is looking further into the future. Six contractors developed conceptual studies on what should be the Defense Communications Satellite System of the longer range future. These studies are now being evaluated and shortly the Defense Communications Agency will make recommendations to the Secretary of Defense on how to proceed to meet needs in the 1970's and later period.

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Each Defense Procurement Circular is designed to place new or changed policy or procedures in effect prior to publication of an Armed Service Procurement Regulation (ASPR) revision. ASPR subscribers will receive DPC's and ASPR revisions through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

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Synthesis of Group IV Organometallic Polymers and Related Compounds. Institute for Organic Chemistry, Utrecht, Netherlands, for the Air Force, Dec. 1965, 92 pp. Order No. AD-629 554. $3.

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All Purpose Matrices for Com-

(*Continued on Page 11*)

CALENDAR OF EVENTS

May 23–26: Annual Meeting and News Conference of Aviation/Space Writers Assn., New York Hilton, New York City.

May 23–27: Annual Convention of Navy League, Miramar Hotel, Santa Monica, Calif.

May 31–June 2: American Society for Quality Control Meeting, New York City.

June 6–10: Society of Automotive Engineers Convention, Detroit Mich.

June 6–10: Society of Plastic Industries Convention, New York City.

June 7–9: Armed Forces Communications & Electronics Assn. Convention, Sheraton-Park Hotel, Washington, D.C.

June 12–15: American Society for Mechanical Engineers Meeting, Philadelphia, Pa.

June 19–23: Assn of Industrial Advertisers Meeting, New York City.

June 19–24: Communication Workers of America Meeting, St. Louis, Mo.

June 20–23: American Nuclear Society Meeting Denver, Colo.

June 21–24: Data Processing Management Assn. Meeting, Chicago, Ill.

June 22–24: 22nd Annual Meeting of the Institute of Navigation, Cedar Rapids, Iowa.

July 5–9: American College Public Relations Assn. Meeting, Boston, Mass.

July 11–15: National Conference of Weights and Measures, Denver, Colo.

July 16–19: National Audio-Visual Assn. Meeting, Washington, D.C.

July 19–23: National Tool, Die and Precision Machining Assn. Meeting, Hot Springs, Va.

Aug. 22–Sept. 10: Science Congress, Tokyo, Japan.

Aug. 26–Sept. 1: American Legion National Convention, Washington, D.C.

DASA Information and Analysis Center Serves Nuclear Research Field

The Defense Atomic Support Agency (DASA) data center at 816 State Street, Santa Barbara, Calif., re-equipped and relocated in modern quarters, has been renamed the DASA Information and Analysis Center (DASIAC). The center is now equipped to serve an extended community of interest in the nuclear research field.

DASA is the joint services organization which plans and coordinates DOD nuclear weapons programs. The agency's responsibilities include nuclear weapons effects research and underground test programs, supervision of the nuclear stockpile, and contingency planning in other nuclear fields. DASA serves as the primary technical and operational contact point between the Military Services and agencies of the Atomic Energy Commission.

In addition to DASA and other DOD agencies, DASIAC information sources now include many other Government agencies. Data from nuclear and non-nuclear tests as well as research reports developed under theoretical laboratory and simulation programs sponsored by DASA and other organizations are regularly received. Under its DASA charter, the center continuously seeks data from agencies not directly associated with DASA-funded research programs. Program areas include electromagnetic blackout, geomagnetics, fluid dynamics, blast wave propagation, ionization and many others.

The center issues several formal publications. The *DASIAC Bibliography* is a bi-monthly collection of abstracts of recent reports and data. *The Nuclear Weapons Effects Review* (NWER) is a classified quarterly technical journal for articles concerning current NWER studies and related topics. Special reports include evaluation of programs, state of the art reports, critical reviews of experimental data or theories, and special facility and instrumentation surveys.

Computer Program Library Services, regularly announced in DASIAC publications, include fully documented in-house programs for cases where transfer to using agencies is practical. Other programs, monitored by the center, are extremely large and complex, or are still under development. In such cases, inquiries are referred to the organizations responsible for the development of the programs.

Visitors to the center are provided private study areas and facilities for the examination of virtually all basic forms of data. Clearance through Service or contractor security channels is required for visits to or requests for information from the center.

USAF Plans Electronics Briefing for Industry

A classified advanced planning briefing for industry will be jointly sponsored by the Electronic Systems Division, Air Force Systems Command, L. G. Hanscom Field, Mass., and the National Security Industrial Association, in Boston, June 28–30.

The briefing is being held to keep industry informed on future plans and policies on the Electronic Systems Division.

The three-day session will provide background on electronic systems long-range planning information through which industry can formulate its objectives.

Included in the briefing will be advanced systems planning of the Electronic Systems Division, as well as related advanced technology developments of the Rome Air Development Center, Griffiss AFB, N.Y., and the Air Force Avionics Laboratory, Wright-Patterson AFB, Ohio.

Firms interested in attending the briefing should write to the National Security Industrial Association, Department N, Suite 800, 1030 15th St. N.W., Washington, D.C. 20005.

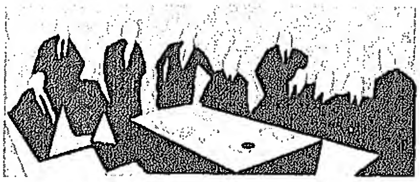
Testing Handbook Available to Industry

The first in a series of handbooks on nondestructive testing developed by the U.S. Army Materials Research Agency and published by the Office of the Assistant Secretary of Defense (Installations and Logistics) is now being distributed.

The handbook, titled "Electromagnetic Testing" (H-54), provides technical guidance to quality and reliability assurance personnel concerned with nondestructive testing techniques used in the detection of discontinuities and other material defects in metals.

Interested persons can purchase the handbook from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., for $1.25 a copy.

A second handbook in the nondestructive testing series, "Radiography" (H-55), has been approved for publication and will be available in about three months.



MEETINGS AND SYMPOSIA

JUNE

Panel Workshop on **Basic Research in Malaria**, June 15–17, at Walter Reed Army Institute of Research, Washington, D.C. Sponsor: Walter Reed Army Institute of Research. Contact: Dr. Elvio H. Sadum, Dept. of Medical Zoology, Walter Reed Army Institute of Research, Washington, D.C. (Area Code 202) RA 3-1000, ext. 3308

Eleventh Science Seminar, June 15–22, at Albuquerque, N.M. Sponsor: Air Force Office of Scientific Research, Office of Aerospace Research. Contact: David L. Arm, Director, Air Force Office of Scientific Research Science Seminar, Air Force Office of Scientific Research, Washington, D.C. 20333, (Area Code 202) 696–6127.

Government Bids, Proposals and Contracts for Small Business Enterprises Institute, June 17–18, at Pittsburgh, Pa. Sponsor: Smaller Manufacturers Council, an affiliate of the Chamber of Commerce of greater Pittsburgh, Pa. Contact: Earl W. Eriksson, Executive Director, Small Manufacturers Council, Chamber of Commerce Building, Pittsburgh, Pa. 15219 (Area Code 412) 391–3400, ext. 15.

Seventh Informal **Photochemistry** Conference, June 20–22, at Rensselaer Polytechnic Institute, Troy, N.Y. Co-sponsors: Army Research Office-Durham and Rensselaer Polytechnic Institute. Contact: Dr. George Wyman, Director, Chemistry Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706, (Area Code 919) 286–2285, ext. 33.

International Conference on **Crystal Growth**, June 20–24, in Boston, Mass. Sponsor: Air Force Cambridge Research Laboratories. Contact: Charles S. Sahagian (CRWPC), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01731, (Area Code 617) CR 4–6100, ext. 3298.

Gordon Research Conference on **Interaction and Transport in Physical, Chemical and Biological Systems**, June 20–24, at Proctor Academy, Andover, N.H. Sponsor: Office of Naval Research. Contact: Mrs. P H. Tenniswood, Code 444, Office of Naval Research Washington D.C. 20360 (Area Code 202) OXford 6–1538.

JULY

1966 Annual Conference on **Nuclear and Space Radiation Effects**, July 18–22, at Stanford University, Palo Alto, Calif. Sponsors: Army Research Office, Institute of Electrical and Electronics Engineers, National Aeronautics and Space Administration, Office of Naval Research and the Air Force. Contact: Lt. Col. J. E. Houseworth, Physical Sciences Div., Army Research Office, Washington, D.C. (Area Code 202) OXford 4–3446.

AUGUST

1966 Linguistic Institute Conference on **Linguistic Method**, Aug. 1–3, at the University of California at Los Angeles. Sponsor: Air Force Office of Scientific Research. Contact: R. W. Swanson (SRI), Air Force Office of Scientific Research, Washington, D.C. 20333, (Area Code 202) OXford 6–5374.

Eleventh International Symposium on **Combustion**, Aug. 14–20, at the University of California, Berkeley, Calif. Co-sponsors: Ballistic Research Laboratory and the Combustion Institute of Pittsburgh, Pa. Contact Dr. R. J. Heaston, Physical Sciences Div. Army Research Office, 3045 Columbia Pike, Arlington, Va., (Area Code 202) OXford 4–3465.

Second **Computer & Information Sciences Symposium on Learning, Adaptation and Control in Information Systems**, Aug. 22–24, at Columbus, Ohio. Sponsors: Office of Naval Research, Battelle Memorial Institute, Ohio State University. Contact: Julius T. Tou, COINS Co-Chairman, Director, Communications Science Research Center, Battelle Memorial Institute, Columbus, Ohio, 43201.

Application of Generalized Functions to System Theory Conference, Aug. 25–26, at the State University of New York, Stony Brook, N.Y. Co-sponsors: Air Force Office of Scientific Research and Society for Industrial and Applied Mathematics. Contact: Capt. John Jones, Jr. (SRMA), Air Force Office of Scientific Research, Washington, D.C. 20333, (Area Code 202) OXford 6–1302.

Unguided Rocket Ballistics, Aug. 30–Sept. 1, at Texas Western College, El Paso, Tex. Sponsor: Army Electronics Research & Development Agency. Contact: V. C. Cochran, Army Electronics Research & Development Agency, White Sands Missile Range, N.M. 88002.

Logic, Computability and Automata, date and place undetermined. Co-sponsors: Hughes Aircraft Co. and the Rome Air Development Center. Contact: C. A. Constantino (EMID), Rome Air Development Center, Griffiss AFB, N.Y., 13440.

Ocean Electronics Symposium, Aug. 29–31, at Honolulu, Hawaii. Sponsor: Hawaii Section, Institute of Electrical and Electronics Engineers (IEEE). Contact: Robert R. Hill Chairman, IEEE Ocean Electronics Symposium Headquarters, 1441 Kapiolani Blvd., Suite 1320, Honolulu, Hawaii, 96814.

SEPTEMBER

U.S. National Committee for **Pure and Applied Biophysics** in connection with Second International Biophysics Congress, Sept. 5–9, in Vienna, Austria. Sponsor: Office of Naval Research. Contact: Mrs. P. H. Tenniswood, Code 444, Office of Naval Research, Washington, D.C. 20360, (Area Code 202) OXford 6–1538.

Sixth Symposium on Naval Hydrodynamics, **Maneuverability, Waves and Physics of Fluids**, Sept 29–30., Oct 3–4, at Washington, D.C. Sponsor: Office of Naval Research. Contact: Mrs. S. W. Doroff, Office of Naval Research, Code 438, Washington D.C. 20360, (Area Code 202) OXford 6–1433.

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An Evaluation of the Ultrasonic Machining Process. Rock Island Arsenal, Feb. 1966, 18 pp. Order No. AD–629 973. $1.

Interfacial Interaction in Composite Structures. Alpha Research & Development, Blue Island, Ill., for the Navy, Feb. 1966, 54 pp. Order No. AD–629 899. $3.

Thermal Conductivity of Pyrex Glass: Selected Values. Army Natick Laboratories, March 1966, 16 pp. Order No. AD–630 135. $1.

Government research and development reports are available to science and industry at price indicated from:
Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Authorized D O D contractors and grantees may obtain these documents without charge from:
Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

Youth Opportunity Campaign

(Continued from Page 1)

• I have directed a re-allocation of Economic Opportunity Act funds to permit an extention of the Neighborhood Youth Corps program to an additional 25,000 boys and girls.

I ask again that the Governor of each of the 50 states, and the Mayor of each city with a population of over 10,000, consider whether a trainee employment program like the one we are working out for the Federal Government will be possible and practicable. One percent of the number of their employees would be 30,000.

Task Force Appointment.

I am asking the Vice President as Chairman of the Youth Opportunity Task Force to appoint an advisory committee to implement and work out the details of the program. This advisory committee will include representatives of the U.S. Department of Commerce, the U.S. Department of Labor, the Small Business Administration, state and local governments, and business and labor organizations.

It must be clear that this program will be worthwhile only if it means extra work-training opportunities over and above those which would normally be offered. It would be worthless or worse if this program only replaced regular employment opportunities.

It must also be clear that we cannot and do not assure all boys and girls work this summer. We all will do the best we can.

A boy or girl who wants a chance to work and who is denied that chance costs this country more than it can afford. This is a special problem demanding special attention.

DLSC Establishes Codification Division

A new international codification division has been established at the Defense Logistics Services Center (DLSC), Battle Creek, Mich., to improve the center's service to NATO.

Captain William E. Sigman, USN, former DOD representative on the three-man Technical Secretariat to the NATO Panel on Codification of Equipment, will direct the division.

The new unit's job is primarily the preparation of supply item identification and the assignment of stock numbers to items produced in the United States which are procured by NATO and other friendly foreign nations.

Nuclear Superiority

(Continued from Page 4)

efforts to determine the difference between earth motions caused by nuclear explosions and earthquakes.

Some extremely significant contributions to the test ban treaty safeguards have come from new techniques in the simulation of nuclear effects. Many of these techniques were developed by the Special Weapons Center and the Air Force Weapons Laboratory, also located at Kirtland AFB and a part of Systems Command's Research and Technology Division.

Effects simulation work began at Kirtland during the 1958-1961 moratorium on nuclear testing. (The Soviets broke the moratorium in 1961 by conducting a series of atmospheric tests.)

Important advances in the simulation state of the art have taken place since then. They have greatly increased our confidence in that some data produced by non-nuclear techniques is reliable and can be correlated with the effects of data obtained from nuclear explosions.

Present Special Weapons Center simulation capabilities are in the areas of nuclear shock and electromagnetic radiation. One form of shock simulation is carried out in a seismic impulse facility in which large systems components and subsystems can be tested. Another form of shock simulation is achieved with a new technique involving high explosives developed by the Weapons Laboratory.

Electromagnetic pulse simulation is carried out with 10-million-volt and 300,000-volt transportable surge generators that create current pulses approaching the current density of natural lightning and the electromagnetic pulse created by a nuclear explosion.

A new center-operated simulation facility will be used to study the effects of transient radiation on electronics. Two very large super-flash X-ray machines are presently under construction for the facility by Physics International Co. and Ion Physics Corp. Development of these machines, which has been guided by the Weapons Laboratory, is a major step forward in the simulation state of the art.

While it is assuming new responsibilities in the operation of nuclear effects simulators, the center continues to support Weapons Laboratory effects research and techniques development. This support includes environmental testing, high speed photography, fabrication and checkout of payloads, and probe antenna design and checkout.

Still another important center contribution to the test ban treaty safeguards is our nuclear weapon systems test program which involves testing and certification of tie-down configuration for weapons carried in air transports, compatability of weapons to delivery aircraft, reliability of bomb racks and release systems for weapons delivery, development of air-launched, air recoverable high altitude sampling rocket capabilities, and sensing devices for arming and fuzing systems.

The Special Weapons Center's role in maintaining our national safeguards under the test ban treaty is a very good indication of the Defense Department's determination to advance military nuclear technology at the fastest possible rate.

Our Government-industry team responsible for keeping the safeguards strong already has achieved a record of remarkable accomplishment. As new simulation techniques are developed, and new applications of nuclear energy explored, the record will become even more impressive.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	Jul 65–Feb 66	Jul 64–Feb 65
Procurement from All Firms	$20,042,934	$15,099,773
Procurement from Small Business Firms	4,275,718	3,181,477
Percent Small Business	21.3	21.1

NOTES FOR EDITORS

Briefed below are some events and projects within the Department of Defense which may be of interest to writers and editors. If further information on any of these topics is desired, please write to Chief, Magazine and Book Branch, Office of Assistant Secretary of Defense (Public Affairs), Washington, D.C. 20301

ARMY TESTS NEW LIGHTWEIGHT AIR CONDITIONERS

Two newly designed air conditioners built to protect electronics gear from damage caused by high temperatures and humidity are being tested by the U.S. Army.

The units are of lighter weight than air conditioners of similar capacities weighing 390 and 520 pounds compared with the 450 pounds and 1,200 pounds of units now used. Wrapper-type frame construction, plate fin compact heat exchangers and lightweight materials account for the weight reduction.

Production units will be used for cooling and dehumidifying missile fire control vans, communications shelters and housings for electronic systems.

NEW FOOD PRESERVATION PROCESS MAY INCREASE VARIETY IN G.I. DIET

Pilots forced to bail out over remote areas may find tasty dinners in their survival kits as a result of Army research on irradiated foods, a new technique hailed by scientists as the first really revolutionary preservation process since the discovery of thermal canning more than 150 years ago.

The new method could result in reduced refrigeration needs, lower food losses through spoilage, better control of food-borne diseases and wider availability of fresh meats and vegetables to field units in combat. The process could also furnish a greater variety of foods to combat personnel operating anywhere and under any conditions.

In the radiation process, the foods are packed and then receive a very small dose of gamma rays from a cobalt-60 source. No radiation remains in the treated food which is as healthful as any heat-processed food.

NEW ARMY COMBAT UNIFORM WILL GIVE GREATER PROTECTION TO TROOPS

The U.S. Army is developing a new all-climate combat uniform designed to give troops a higher degree of protection against such hazards as chemical, biological and radiological agents, thermal radiation and fragments from high-velocity missiles.

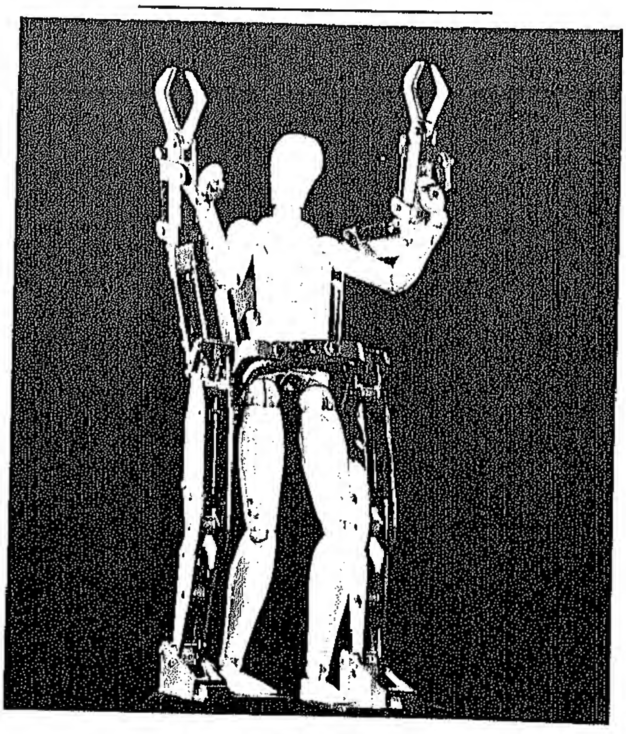
The uniform is a multifunctional protective system equipped with a heat regulation device for maintaining thermal balance regardless of weather conditions or activity. Heat regulation is achieved by circulating air within the clothing system. Main components of the total system consist of an integrated headgear assembly, a body ensemble including handwear and footwear and the integrated heat regulation unit. The prototype weighs 37 pounds.

SURFACE COATING OF SATELLITES STUDIED BY AIR FORCE

A satellite covered with four types of thermal-control coating is orbiting the earth as part of an Air Force experiment to find better surface coatings for present and future spacecraft and satellites.

The four types include solar reflective surfaces, solar absorbers, infra-red emitters and thin-film multi-layered coatings. All were subjected to vacuum, heat and ultraviolet radiation tests before being launched into space from Vandenberg AFB, Calif., March 30.

If the more promising ones fulfill expectations, their improved characteristics will enable future spacecraft and satellites to operate effectively for longer periods. The satellite will remain in orbit for a year with similar experiments planned for the future.



HARDIMAN

A set of mechanical muscles which will enable a man to lift 1,500 pounds while exerting only 40 pounds of force is being developed jointly by the Army and Navy. The unique apparatus, nicknamed "Hardiman," will be attached to an operator's feet, forearms and waist enabling him to perform tasks far beyond his normal strength. The Navy hopes to put Hardiman to work loading bombs on aircraft as well as handling heavy cargo in confined spaces and helping out with underwater salvage jobs.

The Framework of Army Research and Development

by
Brig. Gen. R. B. Marlin, USA
Dir. of Plans and Programs
Office, Chief of Research and Development
Department of the Army

It can be said that the ultimate goal of any research and development effort is to build a better product than one's competitor. In the Defense R&D business the mission is to insure that we develop weapons, equipment and techniques qualitatively superior to those of any potential enemy, in any geographical environment, and under all conditions of war.

Similarly, any successful research and development effort—whether it be private industry or Defense—has to have a number of common components: an objective, qualified people in a workable organizational pattern and, of course, the *sine qua non*—money. For the benefit of those who are not familiar with Army R&D I will summarize the principal features of how the Army plans and determines its objectives, how it is organized for R&D, and how it allocates its R&D money and manages its programs.

In the area of planning I shall focus upon the organizations and procedures through which the Army evolves its broad materiel needs.

Guided by this planning, the next step in the Army process is the definition of systems needs and their justification to the satisfaction of the Army, the Office of the Secretary of Defense, the President, and ultimately to the Congress. At this point, these needs are requirements in that they represent a careful selection of potential advances eliminating the nice-to-have and reflecting real strides forward in combat capability. In this selection they have been subjected to a wide concensus in the Army, wherein the users' views of usefulness and battlefield compatibility have been paramount.

The third portion of the article is aimed at the nature of the program, its conduct, and a brief coverage of some of the management techniques employed.

As background for my further remarks with regard to these areas—there are three important influences which I must mention.

The first of these is the organization of the Army. In mid-1962 two new major Army commands were established. At that time the Army Materiel Command was created and given responsibility for the majority of the hardware development, procurement, and supply and distribution missions of the Army. This action gave central direction and control of these efforts. At the same time the Combat Development Command took over responsibility—under one commander—the previously scattered doctrinal, organizational and material requirements functions for the Army in the field.

The second influence is the necessary continual interplay between requirements definition and fulfillment, and the essential scientific and technological base. The Combat Developments Command (CDC) and the Army Materiel Command (AMC) work closely together so that real advances will result from this cross-feeding of information.

The third influence is the inherent complexity of the Army's problem in defining requirements based on its broad and varied mission. While co cerned with all elements of the spe trum and conflict, the Army's maj role in providing general purpo forces poses an infinite variety potential requirements. This demand that planning, definition and fulfil ment be selective, represent a ba anced use of resources, and be pro ductive within a reasonable time.

At this point, let me cover briefl the organization structure for Arm R&D (Chart 1). At the top of th pyramid is the Secretary of the Arm He is responsible for all of the ac tivities of the Department, to includ those of research and development.

His principal assistant in thes matters is the Assistant Secretary o the Army (Research and Develop ment), who maintains policy super vision over the R&D program. He has a very small staff and relies upon the staff of the Chief of Research and Development (CRD) as may be required in the execution of his responsibilities.

Also involved, but to a lesser degree, is the Assistant Secretary of the Army (Installations & Logistics). He is primarily concerned with preproduction engineering and allied activities which provide the interface between R&D and the procurement of materiel item for Service use, as well as maintaining cognizance over all procurement policies, including those for R&D.

R&D budget requests and programming actions are reviewed and acted upon by the Office of the Assistant

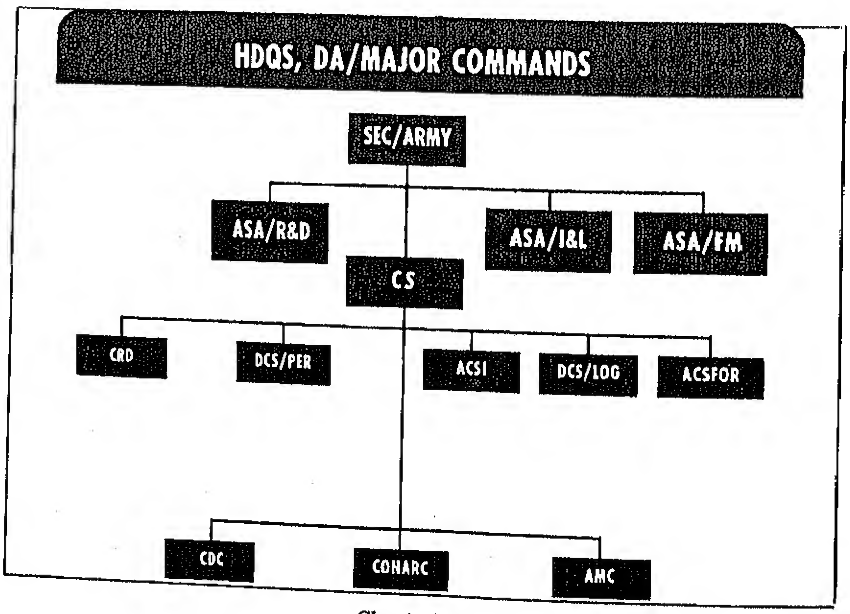


Chart 1.

Secretary of the Army (Financial Management). All of these above-mentioned officials are civilians, appointed by the President.

The Chief of Research and Development is a three-star general and a member of the General Staff. He is responsible to the Chief of Staff of the Army for planning, programming and supervising all Army R&D, while the Deputy Chief of Staff for Personnel is interested in special R&D regarding personnel selection and classification research, and in the impact of materiel developments on the strength and skill levels of the Army. Also on the General Staff is the Assistant Chief of Staff for Intelligence (ACSI). He is responsible for technical intelligence activities, the coordination of surveillance and reconnaissance measures, and for monitoring projects of intelligence and reconnaissance appearing in the R&D program. The monitoring of logistical research and the supervision of production activities for items engineered for Service use is a responsibility of the Deputy Chief of Staff for Logistics, while the Assistant Chief of Staff for Force Development is responsible for supervision and coordination of combat developments and related policy in conjunction with the research and development function assigned to the Chief of Research and Development.

I will mention more on the execution of these General Staff responsibilities later.

As I noted earlier, the Commanding General of the Combat Developments Command is responsible for the doctrinal, organizational and materiel requirements function associated with combat developments or, simply put, determining how the Army of the future should be organized, how it should be equipped, and how it should fight. As an important part of this responsibility, CDC represents the Service users of materiel developed primarily for the Army in the field. The principal relationship of the Continental Army Command with Army R&D is in connection with training aids and devices for both individual and unit training.

The Army Materiel Command is the principal Army developing agency, with about 90 percent of the Army R&D budget expended by that command. Other major Army developing agencies include Office of the Chief of Engineers, Office of the Surgeon General and the U.S. Army Security Agency.

A principal criteria for Army R&D effort and the planning leading toward such effort is that it be requirements oriented. This orientation towards requirements stated by the potential user is conducted in an atmosphere which recognizes the so-called "push of technology." Strategy and doctrine, to include outline organization, is a prime motivator in the planning of Army R&D. The objective here is to insure that systems requirements are not originated in isolation, but are responsive to well conceived and integrated concepts of deployment and use. At the same time it is recognized that innovation may present a systems capability which may lead to new strategy and doctrine. Another important ingredient is provided by the somewhat longer range possibilities of science and technology—the future potentials stemming from a properly supported technological base.

The R&D planning concept, then, is based on the inter-action of the following factors: first, the Combat Developments system, which embraces the formulation of new doctrine, organization and materiel objectives and requirements and the early integration of these products into the Army, the means by which systems requirements are evolved; second, the Army Research Plan, which guides research and exploratory development, the vehicle for planning courses of action leading to advances in the technological base; third, the influence reflected in the Army family of plans, research and development plans, and certain Department of Defense planning documents.

Each plan in the Army family of plans is projected 20 years into the future. The keystone plan is the Basic Army Strategic Estimate (BASE), essentially a long range estimate of the situation which culminates in the statement of a broad strategic concept as it affects the land battle. The R&D input into this plan is the technological forecast portraying scientific and technical advances considered feasible within the time frame concerned. This forecast assumes full exploitation of these capabilities without regard to resource restraints and covers both anticipated U.S. capabilities and significant foreign capabilities.

The second important member of the family of plans is the Army Strategic Plan. This document reflects the strategic concepts contained in the BASE. As part of its coverage, the plan specifies a number of Priority Operational Requirements for materiel development. These requirements are purposely broad in nature to provide maximum flexibility in the means by which they may be met. For example, a current Priority Operational Requirement states the need to develop a capability to conduct operations at night under conditions of poor visibility but with near daylight efficiency. In aggregate, these Priority Operational Requirements describe important goals whose attainment

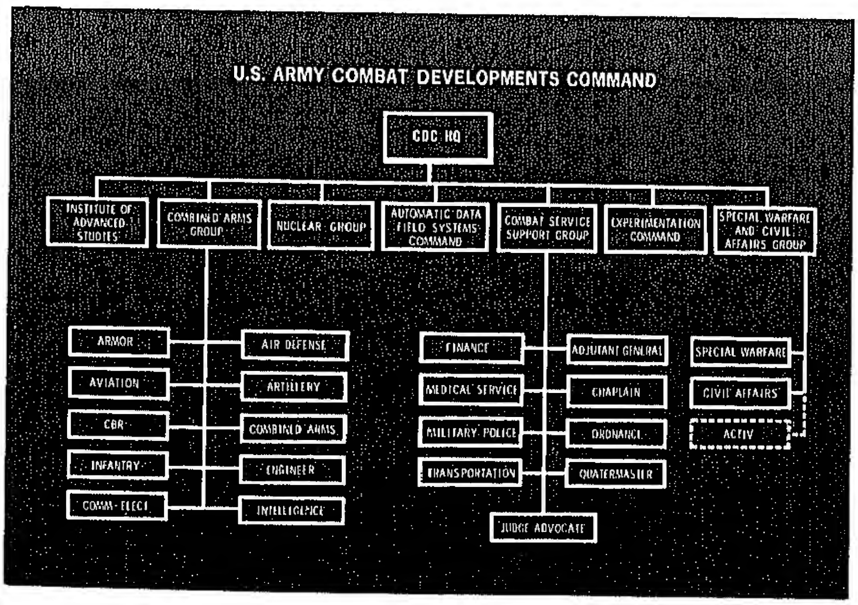


Chart 2.

would significantly improve operational capabilities. These goals guide both Combat Developments Plans and the Army Research Plan. The Army Force Development Plan insures that materiel which results from the R&D program is integrated into existing forces in a manner to best utilize available and on-coming resources. During the development of the plan, R&D personnel provide up-to-date information on the availability of systems under development and temper development progress in accordance with the schedules for the fielding of such systems.

I have already covered the concept of the Army Research Plan. It should be noted that its purpose is to provide a base for future systems and that it covers the research and exploratory development categories. Combat Developments Plans are a product of the CDC and, as approved by the Department of the Army, provide definitive materiel requirements for R&D effort in the advanced, engineering and operational systems development categories. Each developing agency also conducts both long-range and short-range planning for R&D. Long-range planning is aimed at the areas addressed in the technological forecast, while short-range planning covers the period of the Five Year Force Structure and Financial Program.

Another vitally important guidance document is the Army Five Year Force Structure and Financial Program. This is a planning document required by the Department of Defense for all Services, and it contains financial guidance over the immediate five-year period.

Having covered briefly the function of the Combat Developments system, let me elaborate on it a bit. The operation of the Combat Developments system is centered in the Combat Developments Command (Chart 2.)

The Institute of Advanced Studies prepares the long-range, broad-outline, concept studies which set forth what the Army should be like in the future. The Combined Arms Group develops the doctrine studies employing the types of division, corps and field armies associated with each particular time period. Derivative studies for each of the Combat Arms are developed by the subordinate agencies shown, as are initial materiel requirements stemming from such studies. Each of these agencies is collocated where possible with the Army service school and test and evaluation element with which it is associated. For example, the Armor Agency is located at Fort Knox, Ky., with the U.S. Army Armor School and the Armor Board. Thus, the formulation of doctrine and materiel requirements, the service tests of items of hardware, and school training are all conducted at armor installations and activities.

The Combat Service Support Group develops logistics doctrine and organizational concepts to support the combat elements in accordance with the overall conceptual study blueprint. The nine subordinate agencies of the Combat Service Support Group produce derivative studies and materiel requirements in the service support area similar to those produced by the subordinate agencies of the Combined Arms Group.

The Experimentation Command is the field laboratory for evaluating tactical and organizational concepts through battalion level.

The Special Warfare and Civil Affairs Group is responsible for stability operations, unconventional warfare, psychological operations and warfare, psychological operations and civil affairs. It also maintains close liaison with the Army Concept Team in Vietnam.

A key to success in the system is continuous liaison between the elements of CDC and the laboratories, arsenals and test facilities of the Army's developing agencies. The laboratory elements concerned accomplish their functions through both in-house and out-of-house work. About 70 pe[r] cent of the total effort is accomplish[ed] out-of-house.

To describe this organization i[n] general terms (Chart 3), the Chiefs o[f] Research and Development direc[ts] and supervises the Army's Limite[d] War Laboratory — a quick reactio[n] capability—and, through the Directo[r] of Army Research, the research an[d] exploratory development effort o[f] seven research activities of a pro[-]gram-wide nature. The Surgeo[n] General and the Chief of Engineer[s] each direct the laboratory activitie[s] peculiar to their functions, while th[e] Army Security Agency fulfills it[s] laboratory requirements through con[-]tracts and through the laborator[y] facilities of the AMC Electronics Com[-]mand.

Because of the wide scope of activi[-]ties assigned, AMC maintains eigh[t] laboratories of command-wide inter[-]est, such as the Ballistics Researc[h] Laboratory, the Materials Researc[h] Agency and the Human Engineerin[g] Laboratory. In addition, the five Com[-]modity Commands — Missile, Muni[-]tions, Weapons, Electronics and Mo[-]bility—each maintain a laborator[y] capability responsible to its particula[r] commodity area. The Test & Evalua[-]tion Command controls the test boards, proving ground and test centers as[-]signed to AMC.

Turning now to requirements defi[-]nition, the materiel requirements o[f] the Army are stated in four docu[-]ments. First is the Qualitative Mate[-]riel Development Objective (QMDO),

(*Continued on Page 22*)

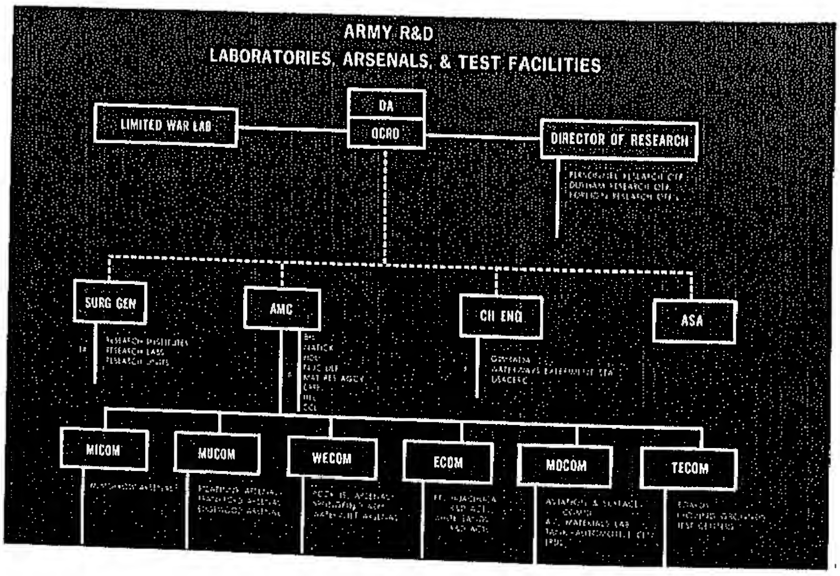


Chart 3.

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MAY 1966

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JULY 1966

SPEAKERS CALENDAR

DEPARTMENT OF DEFENSE

Lt. Gen. H. C. Donnelly, USAF, Dir., Defense Atomic Support Agency, at Memorial Day Observance, Santa Fe, N. M., May 30.

Brig. Gen. J. H. Weiner, USAF Chief of Staff, Defense Communcations Agency, at Institute of Electrical and Electronics Engineers, Philadelphia, Pa., June 15–16.

DEPARTMENT OF THE ARMY

Gen. Frank S. Besson, Jr., Commanding General, Army Materiel Command, at 150th anniversary of Remington Arms Co., Ilion, N.Y., June 16.

DEPARTMENT OF THE NAVY

Rear Adm. Edward J. Fahy, Chief, Ships Systems Command (new title for Bureau of Ships), at ROTC commissioning, Massachusetts Institute of Technology, Cambridge, Mass., June 9.

Rear Adm. Robert H. Speck, Commandant, Fourth Naval District, at Flag Day Luncheon, Philadelphia, June 13.

Hon. Robert H. B. Baldwin, Under Secretary of the Navy, at California Group of Investment Bankers Assn. Meeting, Long Beach, Calif., June 27.

Adm. Alfred G. Ward, U.S. Representative to NATO Standing Group and Military Committee, at Independence Day Celebration, Birmingham, Ala., July 4.

DEPARTMENT OF THE AIR FORCE

Hon. Harold Brown, Secretary of Air Force, at Council on Foreign Relations, New York City, June 6.

Dr. R. G. Loewy, Chief Scientist of the Air Force, at American Institute of Aeronautics and Astronautics Meeting, Columbus, Ohio, June 14–15.

Gen. B. A. Schriever, Commander, Air Force Systems Command, at American Institute of Aeronautics and Astronautics Meeting, Air Force Academy, Colo., June 15; at Tennessee Space Institute, Arnold AF Station, Tenn., July 11.

Brig. Gen. L. F. Tanberg, Dep. Chief of Staff for Materiel, Tactical Air Command, at Institute of Navigation Meeting, Cedar Rapids, Iowa, June 23.

Maj. Gen. B. I. Funk, Commander, Space Systems Div., Air Force Systems Command, at American Society for Quality Control Meeting, Los Angeles, June 28; at British United Services, Los Angeles, July 15.

Maj. Gen. M. C. Demler, Commander, Research & Technology Div., Air Force Systems Command, at Space & Ballistic Missile Technical Symposium, Air Force Academy, Colo., July 6–8.

Lt. Gen. W. A. Davis, Vice Commander, Air Force Systems Command, at Atlantic Research Conference, Costa Mesa, Calif., July 29.

Data Standardization Progresses

Varying requirements levied on the Defense Department for reporting to different organizations under different codes for geographic entities, foreign countries and the United States contributed largely to the establishment of the data standardization program reported in the *Bulletin* in February 1965.

Compound confusion and inability to provide proper and timely data resulted from the varying codes. A few among the differing requirements were personnel reports using a code from a civilian agency, a command and control system using a code based on spelling of the name, a different code for civil defense reports and another code entirely for use in financial records and reports. The codes ranged from two to four digits. More important, the definition and delimitation of terms differed since the geographic entities identified in any two of the codes differed.

Much analytic effort was required before any data interchange or system integration could be effected and, in some cases, reconciliation was impossible. The first data elements to be standardized under the program have been states of the United States, countries, continents and water areas. These standard data elements have been implemented in about 1,000 DOD data systems, allowing integration and interface between such systems as procurement, supply, and command and control. They provide for multi-functional application and the highest level of systems integration obtainable.

The data standardization program was initiated to assure the development and implementation of standard data elements and related codes, i.e., the words and terms used to communicate data and the codes used to represent them. The responsibility for the program was assigned to the Assistant Secretary of Defense (Comptroller).

The uncontrolled evolution of different English terms to identify the same piece of data, such as "Weapons System Designator" and "Account or Weapon System Code" to represent "Ownership Account," led to problems in the DOD data systems. If two systems need to interface and each produces data about a common piece of data identifying a common characteristic, unless the systems internally identify the common characteristic in precisely the same words, meaning precisely the same thing and coded precisely the same way, a varying degree of conversion and interpretation is required. Any conclusions and decisions resulting from analysis of the combined data may easily be erroneous.

Under the program, initiated in September 1964, 12 projects for data standardization have been undertaken within DOD. These projects have been assigned to the various DOD components for development of standard data elements and related codes. Some of the projects for standardization of the data elements and codes are:

- The Military Standard Contract Administration Procedures (MILSCAP) by the Defense Supply Agency.
- The Joint Uniform Military Pay System (JUMPS) by the Air Force.
- The National Military Command System by the Joint Chiefs of Staff.

Hundreds of data elements will be studied in these projects. It is anticipated that many existing codes and data expressions will be eliminated through the refining process of subjecting them to the disciplines of data standardization and developing standard data elements for use in all systems by all DOD organizations.

The impact of the standardization projects varies from such data elements as "Personnel Name," which is mainly used in the many personnel data systems, to such as the "Defense

(*Continued on Page 21*)

FROM THE SPEAKERS ROSTRUM

Excerpts from address by Mr. John M. Malloy, Dep. Asst. Secretary of Defense (Procurement), at the DOD Advanced Planning Briefings for Industry, Boston, Mass., March 3, 1966.

John M. Malloy

Procurement Management Trends

* * * * * *

Contractor's Weighted Average Share (CWAS).

I would like to discuss the first of three new programs that are still in the development stage. One of the more promising procurement concepts which is nearing reality is known as the Contractor's Weighted Average Share in Risk, and bears the euphonious acronym, CWAS. This concept, simply stated, recognizes that a contractor who accepts higher risk contracts has a greater financial motivation to exercise prudent business judgment in the performance of such contracts and, hence, should be given more latitude in performance. I should point out here that this approach will not apply to all of our 20,000 contractors. For example, a contractor whose total business with DOD is as a result of formal advertising will not be affected. Likewise, it will have no affect on other contractors who are involved only in negotiated fixed price competitive contracts. This type of contracting does not require audit review nor are administrative controls normally involved. Nevertheless, we do expect that this new and rather novel approach will be of interest to a great number of Defense contractors.

I mentioned earlier the marked improvements that have been achieved in the past several years in increasing price competition and reducing the usage of CPFF contracts by utilizing more fixed price and incentive contracts. When CWAS becomes effective in the Armed Service Procurement Regulation (ASPR), it will serve to relax or withdraw certain administrative controls and reasonableness overhead audits on those contractors who attain a verifiable "Weighted Average Share" of risk calculated from the mix of contracts being performed. Thus, the concept aligns itself with the procurement trend towards higher risk contracts. It is a very logical development.

The concept, objectives and detailed procedure for determining CWAS should be published early in the next fiscal year in the Armed Services Procurement Regulation. The CWAS technique will then be available, on a voluntary basis, to contractors of DOD. A contractor desiring to participate in this program may do so by determining his own CWAS factor in accordance with our procedures and submitting the requisite data through specified channels for verification. Validation of data relative to commercial or Government firm fixed price contracts may be accomplished by a certification to the data by a certified public accountant. The CWAS concept will be implemented in terms of a contractor's fiscal year.

CWAS is based on the spectrum of zero percent risk to 100 percent risk. A contractor with all cost type contracts would have a zero risk factor, a contractor with all firm fixed price contracts would have a 100 percent factor and a contractor with a mix of contracts would have a percentage of cost risk between these two points. The methodology and percentage currently being considered for use in determining the contractor's dollar cost risk by type of contract are as follows:

Type of Contract	Percentage Factor
Cost Plus Fixed Fee	0
Letter Contract	0
Cost Plus Incentive Fee	15%
Fixed Price Incentive	Per Formula
Firm Fixed Price	100%
Commercial	100%

* * * * * * * *

The development of the threshold, or level at which CWAS becomes applicable is a difficult task. To assist us in this effort, in August of 1965, we requested [illegible] contractors (many having multiple profit centers) stratified in a sample of small, medium and large, to voluntarily compute their CWAS factors. One hundred thirteen contractors having a total of [illegible] separate profit centers responded. Based on this study and other information available, the Defense Industry Advisory Council Working Group studying this concept recommended a threshold of [illegible] with a discretion band in the range of [illegible] to [illegible]. We are now in the process of determining the exact span of the discretion band below the threshold. . . .

Formal comment from industry on these proposals will be solicited in the near future. If we establish the threshold at [illegible] (which is admittedly conservative), we expect that approximately two-thirds of the profit centers holding Defense contracts would qualify for CWAS, and these would account for approximately one-third of our procurement dollars. A large percentage of smaller companies will qualify initially, while a lesser percentage of the larger profit centers will qualify. In the case of large contractors, some profit centers will qualify while others will not. Experience may result in downward revi-

on of the threshold at some future ate.

We consider that the most benecial results of CWAS will derive itially in the relief afforded from easonableness audits of certain of ur cost principles. In other words, e will accept as reasonable the mount of a particular overhead cost icurred by contractors who are bove the threshold without further eview. The underlying assumption is hat the substantial proportion of igh risk type contracts provides, by self, adequate assurance of the reaonableness of incurred costs. It hould be clearly understood, however, that CWAS applies only to inirect costs. Of the 47 cost principles et forth in ASPR, 15 would appear o be completely subject to CWAS, nother 12 would be partially subject o CWAS, for a total of 27. Consideration has been deferred in four ost principles. The balance would ot be subject to the CWAS test of easonableness due to overriding tatutory requirements or public policy considerations.

This concept will also have an ffect on certain ASPR administraive controls. We are proposing ASPR revisions to make CWAS pplicable to Overtime Approvals, Changes in Make or Buy Programs, Review of Contractor's Procurement Systems and Consent to Subcontracting. In other words, the Government vould not involve itself in these reas in the administration of the ontract in the case of contractors who are above the threshold of 65 percent. We are also prepared to nake CWAS applicable to any other ASPR control that can reasonably be dentified as a candidate. The DIAC Working Group on Administrative Controls, however, concluded after engthy study, assisted by the Air Force tests in this area, that the problem of over-control was principally sourced in some lesser administrative requirement than the ASPR.

We are hopeful that this concept will also prove to be of interest and benefit to many subcontractors as well as to primes. Quite often audits are performed by Government personnel at the subcontract level. In such cases, the CWAS concept will apply. In addition, Government reviews of cost data submitted by subcontractors to primes will involve CWAS. Likewise, it would apply to such administrative controls as are applied at the subcontract level. Many of our subcontractors operate in a highly competitive environment which will almost automatically produce a high CWAS rating. Once this concept is operational, we feel sure that our primes will find many additional ways to take advantage of this approach.

Life Cycle Costing in Equipment Procurement.

The second new technique, and one that holds much promise for the future, has been publicized recently under the title of Life Cycle Costing in Equipment Procurement. This concept concerns itself with the influence that changes in suppliers may have on logistics costs and involves consideration of logistics costs in evaluating competitive bids. You may recall that Title 10 of the U.S. Code, Section 2305 (c) states:

> ". . . Awards shall be made with reasonable promptness by giving written notice to the responsible bidder whose bid conforms to the invitation and will be the most advantageous to the United States, *price and other factors considered. . . .*" (*Italics supplied.*)

Traditionally, price has been the determining factor in competitive situations and price competition has meant frequent changes in suppliers. It is those "other factors" which we have heretofore not been able to get a handle on. Hence, this is what life cycle costing is all about—a methodology for defining those other factors in terms of logistics cost. The substantial increase recorded in competitive procurements in recent years has emphasized to us the importance of improving our capability to take these logistics costs into consideration when awarding contracts. It simply does not make sense to pay $10,000 for an equipment if the annual support cost amounts to $50,000 when another equipment serving the same purpose can be acquired for $12,000 and an annual support cost of only $25,000.

Our initial efforts in developing this concept will be concerned mainly with parts, subassemblies and minor subsystems which can be competed. But this represents in excess of six billion dollars annually at the prime level and should be of significant interest to many of you. The real task that must be accomplished is in developing methods for predicting and measuring logistics costs for use in evaluating bids. Ways to measure and evaluate some of these costs are more readily available than others. Thus, as we progress with this program, you will find that some obviously important logistics costs are not going to be involved in the evaluation of bids and proposals.

Any time this technique is used for procurement, the solicitation will contain very precise information as to the factors to be used in bid evaluation. There will be no surprises. Some of the evaluation factors will be based on Government studies as, for example, the cost of adding new items to our inventory. Others will be based on contractor supplied data. This type of data will be verified by the Government, usually by means of some form of demonstration.

Some of the logistics factors that are susceptible to influence by changes in suppliers are as follows:

- Corrective and preventive maintenance.
- Inventory management.
- Inspection, installation and check-out operations.
- Training.
- Transportation.
- Documentation.

The following example demonstrates the application of life cycle costing principles to a non-reparable item:

Navy Storage Battery Procurement

Bid	Unit Price	Discharge Cycle: Guaranteed Charge	Discharge Cycle: Cost Per Charge
A	$29.42	250	.11768
B	28.99	250	.11596
*C	31.55	400	.07888
D	32.77	250	.13108

* Award based on lowest cost per charge/discharge cycle.

Approximately 50 competitive procurements have been selected thus far by the Military Departments for possible award on a life cycle costing basis. As these tests are proceeding, the Military Departments are in the process of developing predictable cost factors for use in these test applications.

We consider successful implementation of this concept to be a relatively long term effort—perhaps as much as three years in the making. We do not pretend at this point in time to have all the answers we need.

I can assure you, however, that we intend to make every effort to get the answers and to take logistics costs into consideration at every possible opportunity. The concept is so rational and the objectives so important that we are determined to press on with this effort. By so doing, I am confident that in the long run substantial improvement can be made over the traditional disregard of logistics cost differences in contract award decisions in equipment procurement.

Total Package Concept.

Another development of major interest to us today is the emergence of the "total package concept" of procurement. This method of procurement was first employed on the C-5A aircraft and is currently being applied to the Navy's Fast Deployment Logistics Ship (FDL). The concept, developed by the Air Force, provides for the initial acquisition, through competition, of as much of a total system as is possible. As contrasted with our usual method of sequential procurement of development, followed by production, this new technique involves competing at the outset, not only the development phase but also production units and most of the logistics support, such as aerospace ground equipment and spare parts. Conceptually, we feel that this method of procurement offers substantial advantages and, if successfully proven in practice, represents a major breakthrough in contracting techniques.

In the past, the development contract for major systems has been awarded under circumstances that made it extremely difficult for us to avoid awarding the follow-on production contracts on other than a noncompetitive basis. The very large investment in engineering and tooling costs by the initial development source would have to be duplicated by the Government, or a potentially competing source, making practical competition impossible. Furthermore, under the past practice of sequential awards of development, production and support, the contractor had no positive incentive to look beyond the requirements of that part of the procurement cycle in which he was performing. Under the package procurement approach the contractor, being committed to the cost and performance of the production articles before detail design begins, has a strong incentive from the outset to design for economical production, reliable operation and low operating and maintenance costs, all of which are strongly influenced by actions taken during the design period. The objective is to realize the benefits that flow from a production commitment earlier in the acquisition cycle.

Total package contracting does nothing but apply to Defense procurement the concepts of a free economy operating in a market place environment and subject to the law of supply and demand. It simply allows the Government, like any buyer in the commercial world, to make a choice between competing products on the basis, not of estimates, but of binding commitments concerning the performance and price of operational equipment including, where practicable, life-time operating costs. It establishes these commitments competitively for as much of a program as practicable, and then permits the winning competitor's profit ultimately to be determined under an incentive arrangement which relates opportunity to risk. Profit is targeted initially in competition and is finally determined by the quality of the product and by the efficiency of the winning competitor, as it should be.

We have already seen in the initial experience of this new concept that the discipline required of both the Government and the competing contractors is substantially greater than under past practice. We have observed that with the increased commitment required of competitors, proposals were substantially more realistic and struck a better balance between performance and cost commitments.

This concept is now being used or contemplated for use on at least two other procurements, the Air Force's short range attack missile, and the Army's advanced aerial fire support system. Each potential application is based on a careful review of the suitability of the particular project for this approach. The extent to which this approach should be used in future DOD systems procurements is under study. We expect to apply it to selected systems that meet certain guidelines now under consideration.

We have had intensive studies under way ever since the emergence of this concept in order to develop criteria for applying a package pla to future selected programs. It apparent that the fundamentals (this concept must be defined and th criteria for its application develope Since it overlaps or interfaces wit other DOD procedures, such a source selection, contract definitio and data management, these inte faces must be studied to insure co sistency and harmony. The problem associated with this new procedur must be identified and better unde stood. All these factors will be con sidered in the studies now under way As part of these studies, it is ou intention to examine the problem reported by subcontractors and vend ors. These will be examined in th cumulative impact of not only th package procurement concept, bu other policies and procedures affect ing or controlling source selection contract definition and associated ac tions.

What are the implications of thi development for industry? This, o course, will become clearer as th studies now under way progress an as we gain experience in its use o these initial efforts. I would ventur to speculate that the concept woul not be applicable initially to mor than a half dozen major systems an nually. It is likely that the basi approach, involving something les than "total," will be used in othe than major system procurements for example, the development an limited production of a major subsystem or component. It is apparent that the discipline required prior to, during and after selection will be much more stringent than in past practice It offers a truly competitive environment in which the opportunities for the efficient producer are greatly enhanced, both from the viewpoint of winning the competition and of the subsequent rewards for efficient technical and business management. With the increased responsibilities accruing to a contractor must come the relaxation of Government controls which are necessary without the constraints of competition. Opportunities for competent and efficient subcontractors and vendors will be enhanced, since the prime will have considerable incentive to establish and stay with the most competent and efficient subcontract and vendor structure possible.

As we see this new concept at this point, it offers great potential.

It also poses a very big challenge. The challenge is to insure that we are able to define the conditions requisite for its use; to be able to structure such contracts in a way that they will exert a continuing positive incentive on the contractor to design and produce the most cost effective system from a life cycle viewpoint and, at the same time, assure ourselves that contractors are not assuming abnormal or extreme risks not subject to their control.

As with any new concept, we are asking ourselves several basic questions at the present time:

• Will total package awards always be made to the low bidder, thus tempting the winning competitor to lower his quality, and give us shoddy equipment? We think not. This will be the result only if the contract is ignored or not enforced. Total package contracting does not require awards to be made to the low bidder. It does require performance and price commitments by competitors, and the award can then be made after considering all factors, in an integrated, meaningful manner.

• Will the disciplines inherent in total package contracting stifle innovation and creative technology? This is a legitimate concern, but I believe the danger can be avoided by expressing requirements in terms of performance, and by including performance incentives in the contract in a manner which relates improvements to their cost to the Government. Under the right circumstances, the opportunity for innovation and creative technology will be enhanced.

• Will the Government discipline itself to the realities of the authority-responsibility relationship inherent in total package contracting, that is, will it permit the contractor ample freedom of action to meet his commitments in his own way? This is critical. If we place responsibility on the contractor, then we must give him the authority to carry it out.

• Are we asking for too much data in total package competition, or are the competitors furnishing too much —or both? The answer is probably yes on both counts. Considerable improvements can be made in this area.

• Does total package contracting require too much competitor effort during the competition? I am the first to concede that a competitor must do a great deal of work before he can make commitments on a system for which the building blocks are in hand, but which has not yet been developed or tested as an integrated unit. But if contract definition is to accomplish its task of helping the Government to make a rational decision before proceeding with development, then the additional work needed for a competitor to make binding commitments on production units can be within reasonable bounds.

• A related question: Is this type of competition too expensive at both the prime and subcontract level? In view of the stakes, often including potential commercial sales, it is difficult to say how much is too much. Furthermore, in a free competitive economy, should the customer try to restrain the competition? Perhaps the Government should pay more for the help it receives in making a decision to proceed. In any event, we are giving close attention to this aspect.

• Is too much time required for us to pick a winner after all the proposals are in? On the C-5, it took five months. During this period, the competitors held much of their teams together, at great cost. Whether this can be improved, I do not know. I suspect so, if we emphasize performance rather than equipment specifications.

• The last question is, how far can we go in applying this technique? It must be limited to cases where the technical factors and risks, and the product, can be defined within reasonable limits. Above all else, we must be sure that we continue to acquire superior weapons. However, increasingly over the past several years, DoD has embarked on advanced development programs intended to establish experimentally the feasibility of subsystems and components before full development is initiated.

To sum up on this subject, it has been demonstrated thus far to our satisfaction that the package procurement concept is feasible and workable. It offers a potential that we intend to utilize fully. The decision to apply this concept, its impact upon contractors and subcontractors throughout the entire procurement process must all be carefully preplanned and integrated into the contract definition phase and reconciled with other existing DOD policies where an interface exists.

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Data Standardization

(Continued from Page 17)

Organizational Entity," which is used in almost every DOD system. Many of the data elements impact more broadly than DOD systems entering data systems throughout the Federal Government and some even through industrial data systems. Defense organizational entity is envisioned as one of these.

The Federal Government data standardization program, under the guidance of the Bureau of the Budget (BOB), has been initiated within the last year. Currently, eight projects have been undertaken in the same data spheres as the DOD projects which are being coordinated and tied in with the Government-wide efforts. Organizational work is in process under the sponsorship of the Business Equipment Manufacturers Association (BEMA) to extend standardization of data elements to the U. S. industrial and commercial community through the X.3 committee of American Standards Association (ASA). Five data standardization projects are under development.

An example of a data element project which is presently under development at all three levels is standardization of calendar date. A survey indicated that one of the DOD components used 77 different ways of expressing date, either in format or character, or both. A standard expression of date in six digits, in year, month and day sequence, has been recommended by DOD, BOB and the ad hoc ASA separate work groups, and will soon be circulated for official coordination.

The DOD approach to the program is to standardize the data elements and codes in data systems under development; standardize those data elements and codes common to most data systems throughout DOD; and standardize the remaining data elements and codes in existing operational data systems. These steps will be both sequential and simultaneous, depending on the case. Implementation of the standard data elements is a separate action from the standardization itself. It will be undertaken on a scheduled basis to make the least impact on operational data systems. Implementation of standard data elements will be individually scheduled by system or by data element.

To increase understanding of the standard element and codes program, briefing on its beginnings, its principles and its progress is currently being presented extensively to organizations so requesting by the Data Standards Division of the Office of the Assistant Secretary of Defense (Comptroller).

(*Continued from Page 16*)

which states a military need for materiel whose feasibility of attainment is unknown or in question. This document is a guide for research and exploratory development.

Next, the Advanced Development Objective (ADO) states a need believed feasible of attainment and covers items to be developed for experimental or operational test. The ADO guides effort in the advanced development category. Third is the Qualitative Materiel Requirement (QMR), which states a military need for a new item, system, or assemblage whose development is believed feasible. The QMR guides engineering development of an item for Service use. The fourth requirements document, the Small Development Requirement (SDR) covers minor items of proven feasibility. As the name describes, these are small developments which can be provided in a relatively short time, are not complex, and are of relatively low cost.

Army requirements documents are normally drafted by the appropriate Combat Developments agency. The preparing agency accomplishes coordination with other interested agencies of CDC and informally with the developing agency. The latter provides an early means of insuring interplay and exchange of concepts between the user and the technological base represented by the developer. The draft document is then forwarded through the Combat Developments group to Headquarters, CDC.

Headquarters, CDC, reviews and modifies the document as necessary and then effects formal coordination of the requirement with the appropriate developing agency—normally AMC. It is at this point that CDC again profits by the gamut of scientific skills of the developing agency. The requirement is also coordinated with other Army commands, with the other Services, and with certain allies.

Within the Department of the Army each requirement is reviewed by all interested agencies. Those requirements which will have a major impact on total Army resources are further referred to the Materiel Requirements Review Committee. This committee is a Chief of Staff committee composed of general officers from the Army Staff and from the major commands concerned. When Department of the Army approval has been granted, the requirements document is sent to the developing agency for the conduct of responsible research and development effort.

Systems analysis and cost effectiveness studies play an important part in the Army's definition of materiel requirements. These efforts vary in extent and formalization ranging from simple analysis of low costs, low density items to full examination of complex or high cost systems. The results of these studies reduce the unknowns and provide parameters to assist in decisions related to the initiation of development by answering such questions as: Is the system operationally suitable? Is development feasible? Is there a better way to perform the mission from a total cost standpoint? The Materiel Requirements Review Committee, which I mentioned earlier, often calls for a review of these considerations termed Total Feasibility.

The Chief of Research and Development has Army General Staff responsibility for the justification of the R&D program to the Office of the Secretary of Defense and to the Congress. Within the Office of the Secretary of Defense, the majority of these activities are conducted with the Office of the Director of Defense Research and Engineering. This relationship is carried out informally through personal contacts at all levels. Formal exchanges occur through ad hoc groups, memoranda, and documents established by DOD directive.

Related program justification type actions are carried out with the Office of the Assistant Secretary of Defense (Comptroller) primarily regarding financial matters and with the Office of the Assistant Secretary of Defense (Systems Analysis) in the areas of cost effectiveness and alternative programs.

The Army is also responsible for the detailed justification of its approved program to the various Congressional committees.

Another important insight into the Army R&D process lies in the area of program content and execution. Approximately 38 percent of the Army R&D program is devoted to "National Programs." These are projects which are being conducted as Army responsibilities and which are of overall major importance to the national interest. In this list are Nike-X, the Army's anti-ballistic missile system, and the National Range at White Sands.

Approximately 31 percent of the program is aimed at Army developments directly supporting Army responsibilities for the conduct of the land battle. The projects concerned range from relatively inexpensive items such as those for combat rations, clothing and equipment to major developments such as Lance. Another 23 percent of the program provides for the technological base and establishes the building blocks of science and technology for future Army systems. The remainder of the program, about eight percent, provides for service testing of Army equipment and for the operation and maintenance of Army R&D facilities.

As I mentioned earlier, the Five Year Force Structure and Financial Program furnishes financial guidance for the Army R&D program. This document is essentially an attempt to forecast in some detail the way the Army R&D monies will be spent over the coming five-year period. If you could look at the current version, you would note that the level of financial support for testing and facility operations and support for future systems is relatively stable over the period. However, a tapering off of Army developments and National Programs after 1968 appears, reflecting the movement of several projects out of the high cost areas of engineering and operational systems development. This trend is in accordance with the Program Change Proposal concept whereby new programs must constitute justified additions to the approved programs under way.

The detailed development of the R&D program, including the Base Program and the Program Change Proposals, begins some 18 to 20 months prior to the year of execution. In this process the Army provides program and financial guidance to the developing agencies. The programs are then developed in detail, originating at the laboratory level, and are successively reviewed by the Army Staff and the Office of the Secretary of Defense.

A special management technique used principally by the AMC is project managership. This technique is currently being applied to some 11 major research and development projects. The AMC project managers, who report to the Commanding General,

AMC, control all resources allocated to the project concerned and can call on other elements of AMC for assistance. Through the use of this technique, project managers control about 37 percent of the R&D funds made available to AMC.

Each Army research and development project is closely monitored by a project officer located in the Office of the Chief of Research and Development. This officer is responsible for maintaining up-to-date information concerning the status of the project concerned, for pinpointing problems as early as possible, and for assisting in the resolution of such problems.

In addition, a system of Department of the Army system staff officers has been established to provide a focal point for up-to-date information on selected major projects. At the present time there are 34 items under system staff officer monitorship, including 26 containing research and development elements. The system staff officer coordinates, develops and maintains milestone schedules across the spectrum of personnel, training, research and development, acquisition and maintenance; monitors execution against these milestone schedules; and prepares consolidated periodic progress reports on the systems concerned.

Army technical committees meet monthly to maintain formal cognizance over the principal life-cycle events of Army materiel. In the research and development area these technical committees coordinate and record actions on the initiation and termination of projects and on the type classification of items for Service use.

The Department of the Army receives a number of periodic progress reports on research and development projects. Recurring program-wide reports emphasize program execution as well as financial status. Special reports cover areas such as reliability and maintainability.

Another technique used to manage the conduct of a development project is the "in-process" review. This review is a periodic stock-taking analysis conducted at selected critical points in the development cycle to evaluate the status and future course of the project. In addition to the developing agency, CDC, the Department of the Army Staff, and interested major field commands are represented at the in-process review.

This, then, is a summary of the Army's R&D structure. We do not contend it is a perfect system; in fact, we are continually seeking ways to improve it. However, it is a workable system which is producing the best products and that is our goal.

Agenda Set for DOD Education and Training Conference

The following is the program agenda for the conference on Engineering Systems for Education and Training to be held on June 14 and 15 at the Twin Bridges Marriott Motor Hotel, Washington, D.C. The conference will be sponsored by the Defense Department with the participation of the Office of Education and in affiliation with the National Security Industrial Association. (See article, "Industry Cooperation Sought To Improve Effectiveness of DOD Education and Training," *Defense Industry Bulletin*, April 1966.)

FIRST DAY

Morning Session: Keynotes.

Government representatives:

Hon. Thomas D. Morris, Assistant Secretary of Defense (Manpower).

Hon. Harold Howe, Commissioner, Office of Education.

Hon. Stanley Ruttenberg, Manpower Administrator, Department of Labor.

Industry representatives:

Dr. Sterling Livingston, Harvard University.

Mr. George Haller, Vice President for Advanced Technology Services, General Electric Co.

Afternoon Session: Service Presentations.

Each Military Service will describe briefly the scope and magnitude of its overall training programs. Training areas of priority concern to each Service will then be discussed in light of:

- The application of advanced technologies and management techniques to give industry an idea of DOD various stages of development in these areas.
- The degree to which industrial research and development, problem solving and equipment capabilities have been used successfully.
- Anticipated priority and problem areas over the next five years which industry might want to explore.

Speakers:

Brig. Gen. Frank Izenour, USA, Dir., Procurement, Training and Distribution, Office of Dep. Chief of Staff, Personnel, Department of the Army.

RAdm. Mason B. Freeman, USN, Asst. Chief for Education and Training, Bureau of Naval Personnel.

Maj. Gen. John H. Bell, USAF, Dir. of Personnel Training and Education, Office of Dep. Chief of Staff, Personnel, Department of the Air Force.

Col. Leo. V. Gross, USMC, Head, Training Branch, Office of Asst. Chief of Staff G-3, Headquarters, U.S. Marine Corps.

The Office of Education will present its policies and plans for various aspects of education technology.

Speaker:

Dr. R. Louis Bright, Associate Commissioner of Education.

SECOND DAY

Morning Session:

Adaption of Research to Technology.

Speakers:

Dr. Alexander Schure, Consultant, Office of Education, and President, New York Institute of Technology.

Dr. Launor Carter, Vice President, System Development Corporation.

Instructional Systems Technology.

A panel briefing on the specific Service projects which have utilized the systems approach to training problems and present DOD thinking about future expansion of this concept.

Computer-Based Information and Instruction Systems.

A panel briefing on use of computers as a management tool and as media for instruction in light of present usage, plans for expansion, trends in the state of the art, and particular problem areas for which automated data processing offers extreme potential.

Summary of Highlights of the Conference.

Speakers:

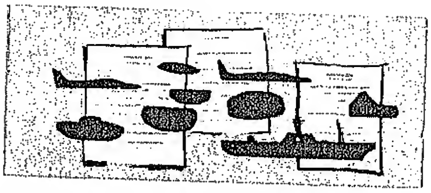
Mr. Marvin Kahn, Chairman, National Security Industrial Association Training Advisory Committee.

Dr. R. Louis Bright, Associate Commissioner of Education.

Hon. Thomas D. Morris, Assistant Secretary of Defense (Manpower).

For additional information and attendance applications contact:

Mr. Paul A. Newman
National Security Industrial Association
1030 15th St. NW
Washington, D.C.
Phone (Area Code 202) 296-2266



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of April 1966:

DEFENSE SUPPLY AGENCY

1—Hyster Co., Portland, Ore. $1,567,215. 141 gasoline fork-lift trucks of 10,000 pound capacity each. Portland. Defense General Supply Center, Richmond, Va.
—Howard Knit Products, Gastonia, N.C. $1,153,005. 2,335,840 men's white undershirts. Gastonia. Defense Personnel Support Center, Philadelphia.
—Delta Petroleum, New Orleans. $3,341,704. 7,300,315 gallons of lubricating oil. Defense Fuel Supply Center, Alexandria, Va.
4—Stebco Industries, Chicago. $1,613,136. 215,660 pneumatic nylon mattresses. Chicago. Defense Personnel Support Center, Philadelphia.
—Mason & Hughes, Philadelphia. $1,818,090. 133,880 men's cotton twill flying coveralls. Philadelphia. Defense Personnel Support Center, Philadelphia.
—Endicott Johnson Corp., Endicott, N.Y. $1,657,600. 175,000 pairs of combat service boots. Endicott. Defense Personnel Support Center, Philadelphia.
—Pettibone Mulliken Corp., Government Defense Products Div., Washington, D.C. $2,024,366. 106 diesel fork-lift trucks. Washington, D.C. Defense General Supply Center, Richmond, Va.
5—Cleary Uniform Co., New York City. $1,191,000. 30,000 men's wool gabardine overcoats. New York City. Defense Personnel Support Center, Philadelphia.
—Howard Knit Products, Gastonia, N.C. $1,264,908. 2,464,160 men's white undershirts. Gastonia. Defense Personnel Support Center, Philadelphia.
—Alpha Industries, Knoxville, Tenn. $1,032,000. 150,000 men's nylon cotton sateen field coats. Knoxville. Defense Personnel Support Center, Philadelphia.
—Tucker Mfg. Co., Montgomery, Ala. $1,095,431. 3,577,500 wooden tent pins and 4,839,000 sixteen-inch-long wooden tent pins. Montgomery. Defense Personnel Support Center, Philadelphia.
6—Sportwelt Shoe Co., Nashua, N.H. $3,393,000. 350,000 pairs of combat service boots. Nashua. Defense Personnel Support Center, Philadelphia.
7—Graniteville Co., New York City. $1,102,113. 1,662,000 yards of cotton sateen cloth. New York City. Defense Personnel Support Center, Philadelphia.
—B. G. Colton, division of Raylon Fabrics, New York City. $1,253,060. 476,000 linear yards of wind-fire and water-resistant cotton sateen cloth. New York City. Defense Personnel Support Center, Philadelphia.
—DeRossi & Sons, Vineland, N.J. $1,180,423. 69,720 men's wool tropical coats. Vineland. Defense Personnel Support Center, Philadelphia.
—Gulf Oil Corp., Houston, Tex. $2,851,116. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.
—Atlantic Refining Co., Philadelphia. $1,163,780. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.
—Hess Oil & Chemical Corp., Perth Amboy, N.J. $1,130,377. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.
—Socony Mobil Oil Co., New York City. $1,043,468. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.
8—Sterling Drug, Inc., New York City. $3,282,180. Primaquine and chloroquine products. New York City. Defense Personnel Support Center, Philadelphia.
—Boothe Packing Co., Modesto, Calif. $1,369,807. Assembly of 1,662,408 cases of individual combat meals. Modesto. Defense Personnel Support Center, Philadelphia.
—Wales Co., Boston, Mass. $1,316,000. 35,000 men's wool gabardine overcoats with removable liners. Boston. Defense Personnel Support Center, Philadelphia.
11—J. P. Stevens & Co., New York City. $1,528,242. 185,560 wool blankets. Defense Personnel Support Center, Philadelphia.
—Otis Elevator Co., Cleveland, Ohio. $1,156,200. 200 electric fork-lift trucks. Defense General Supply Center, Richmond, Va.
12—Putnam Mills Corp., New York City. $1,188,720. 1,651,000 yards of nylon oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.
—Putnam Mills Corp., New York City. $2,900,000. 4,000,000 yards of wind resistant cotton poplin cloth. New York City. Defense Personnel Support Center, Philadelphia.
—Dan River Mills, Inc., Danville, Va. $1,581,656. 1,990,000 yards of wind resistant cotton poplin cloth. Danville. Defense Personnel Support Center, Philadelphia.
—Centre Mfg. Co., Centre, Ala. $2,490,667. 223,600 men's and 6,240 women's nylon raincoats and 840 women's raincoat hoods. Centre. Defense Personnel Support Center, Philadelphia.
—J. P. Stevens & Co., New York City. $4,366,500. 1,650,000 linear yards of polyester fiber and wool tropical cloth. New York City. Defense Personnel Support Center, Philadelphia.
—J. P. Stevens & Co., New York City. $1,371,251. 720,000 yards of cotton-nylon oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.
—Deering-Milliken, Inc., New York City. $1,924,560. 729,000 linear yards of polyester fiber and wool tropical cloth. New York City. Defense Personnel Support Center, Philadelphia.
15—U.S. Rubber Co., Mishawaka, Ind. $7,068,486. Runway and taxiway membrane surfacing nylon. Mishawaka. Defense Construction Supply Center, Columbus, Ohio.
—Otis Elevator Co., Cleveland, Ohio. $1,024,438. 206 fork lift trucks. Cleveland. Defense General Supply Center, Richmond, Va.
—Marmac Industries, Marysville, Mich. $1,590,285. 22,124 combat vehicle crewmen's helmets. Marysville. Defense Personnel Support Center, Philadelphia.
—Endicott Johnson Corp., Endicott, N.Y. $1,009,000. 100,000 pairs of safety shoes with neoprene cork soles. Endicott. Defense Personnel Support Center, Philadelphia.
18—Kaiser Steel Corp., Oakland, Calif. $23,930,000. 100,000 non-perforated steel landing mat sets. Oakland. Defense Construction Supply Center, Columbus, Ohio.
—American Electric Co., Paramount, Calif. $10,132,196. 41,650 non-perforated steel landing mat sets. Paramount. Defense Construction Supply Center, Columbus, Ohio.
—Townmotor Corp., Cleveland, Ohio. $1,850,200. 440 fork lift trucks. Cleveland. Defense General Supply Center, Richmond, Va.
—Anderson Clayton & Co., Dallas, Tex. $1,084,470. 5,781,204 pounds of lard shortening compound. Dallas. Defense Personnel Support Center, Philadelphia.
—Edgewood Casuals, Inc., Lexington, N.C. $1,395,475. 553,700 men's tan cotton four-ounce poplin shirts. Lexington. Defense Personnel Support Center, Philadelphia.
19—Springs Cotton Mills, New York City. $2,025,100. 3,080,000 yards of wind resistant cotton poplin cloth. New York City. Defense Personnel Support Center, Philadelphia.
—Avondale Mills, Sylacauga, Ala. $1,304,925. 2,055,000 yards of wind resistant cotton poplin cloth. Sylacauga. Defense Personnel Support Center, Philadelphia.
—Waterbury Button Co., Waterbury, Conn. $1,097,676. 11,321,712 metal uniform buttons. Waterbury. Defense Personnel Support Center, Philadelphia.
—Electro Plastic Fabrics, Inc., Pulaski, Va. $2,948,256. 533,820 coated nylon twill ponchos. Pulaski. Defense Personnel Support Center, Philadelphia.
—Kenneth M. Wilson Co., Centerville, Tenn. $3,000,000. 500,000 coated nylon twill ponchos. Centerville. Defense Personnel Support Center, Philadelphia.
—Hyster Co., Portland, Ore. $1,890,800. Two-hundred 15,000-pound gasoline fork lift trucks. Portland. Defense General Supply Center, Richmond, Va.
22—Sierra Engineering Co., Sierra Madre, Calif. $1,009,490. 11,800 flying helmets. Sierra Madre. Defense Personnel Support Center, Philadelphia.
—Trenton Textile Engineer & Mfg. Co., Trenton, N.J. $1,358,022. 70,760 nylon-duck rucksacks. Trenton. Defense Personnel Support Center, Philadelphia.
27—Imperial Reading Corp., Blue Ridge Mfg. Div., New York City. $1,016,880. 456,000 blue denim cotton trousers. New York City. Defense Personnel Support Center, Philadelphia.
—Rubber Fabricators, Inc., Grantsville, W. Va. $1,613,136. 215,660 pneumatic mattresses. Grantsville. Defense Personnel Support Center, Philadelphia.
—Springs Cotton Mills, New York City. $1,279,687. 1,950,000 linear yards of sateen cloth. New York City. Defense Personnel Support Center, Philadelphia.
28—Hercules Powder Co., Wilmington, Del. $2,100,000. 400,000 gallons of herbicide. Defense General Supply Center, Richmond, Va.
29—Humble Oil & Refining Co., Houston, Tex. $2,898,000. 750,000 barrels of diesel fuel oil. Defense Fuel Supply Center, Alexandria, Va.
—Texas City Refining, Inc., Texas City, Tex. $4,548,726. 34,020,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va.

ARMY

1—Sonetronics, West Belmar, N.J. $1,306,371. Head set microphones. West Belmar. Army Electronics Command, Philadelphia.
—Ford Motors, Dearborn, Mich. $1,101,836. ¼-ton utility trucks. Highland Park, Mich. Army Mobility Command, Warren, Mich.
—Martin-Marietta, Orlando, Fla. $7,377,882. Development of Pershing missile components. Orlando. Army Missile Command, Huntsville, Ala.
—Vinnell, McNamara, Mannix, and Fuller, Alhambra, Calif. $20,816,779. Work on the John Day Lock and Dam Project, Sherman County, Oregon. Engineer Dist., Walla Walla, Wash.
—City of Pine Bluff, Ark. $1,463,000. Alteration and relocation work on Lock & Dam #4 Project, Arkansas River. Engineer Dist., Little Rock, Ark.
—Standard Winding Co., Division of Ovirtron Corp., Newburgh, N.Y. $1,529,560. Production of radio amplifiers. Newburgh. Army Electronics Command, Philadelphia.
—Bell Helicopter Co., Fort Worth, Tex. $2,797,576. Tail boom assemblies. Fort Worth. Army Aviation Material Command, St. Louis.
—National Presto Industries, Eau Claire, Wis. $18,847,460. High explosive artillery shells. Eau Claire. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Firestone Tire & Rubber Co., Akron, Ohio. $3,820,538. Metal parts for high explosive Anti-tank projectiles. New Bedford, Mass. Ammunition Procurement & Supply Agency, Joliet, Ill.
—National Lead Co., Pottstown, Pa. $1,300,063. Bomb body assemblies. Pottstown. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Carter Carburetor, Division of ACF Industries, St. Louis. $3,446,967. Bomb metal parts. Olivette, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Mertz Engineering Co., Indianapolis, Ind. $2,617,140. Bomb dispenser assemblies. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Batesville Mfg. Co., Batesville, Ark. $3,437,230. Bomb metal parts. Batesville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Industrial Metal Fabrication Co., Newark, N.J. $1,500,280. Shiping and storage containers. Wayne, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Temco, Inc., Nashville, Tenn. $1,771,997. Artillery illuminating shells. Nashville. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Kisco Co., St. Louis. $1,273,702. Artillery cartridge metal parts. St. Louis. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Stelma, Inc., Stamford, Conn. $2,016,900. Telephone-telegraph terminals. Stamford. Army Electronics Command, Philadelphia.
—Caterpillar Tractor Co., Peoria, Ill. $22,-187,500. Tractors. Peoria. Army Mobility Equipment Center, St. Louis.
—Stanford Research Institute, Menlo Park, Calif. $2,218,159. Basic research in surveillance processes. Menlo Park. Army Research Office, Durham, N.C.
—Federal Laboratories, Saltsburg, Pa. $1,-096,949. Hand grenades. Saltsburg. Edgewood Arsenal, Md.
—AVCO Corp., Stratford, Conn. $6,002,589. T-53-L-11 and T-53-L-13 engines for the UH-1 helicopter. Stratford. Army Aviation Materiel Command, St. Louis.
—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $1,790,000. Long lead time items and components required for manufacture of CH-54A helicopters. Stratford. Army Aviation Materiel Command, St. Louis.
—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $1,210,000. Additional work on long lead time items and components required for manufacture of model engines for CH-54 aircraft. East Hartford. Army Aviation Materiel Command, St. Louis.
—Eureka Williams Co., Bloomington, Ill. $2,092,451. Bomb fuzes and miscellaneous components. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Albion Malleable Iron Co., Albion, Mich. $1,712,340. Body and band assemblies for 81mm projectiles. Albion and North Richmond, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

4—Bell Helicopter, Division of Bell Aerospace Corp., Fort Worth, Tex. $1,264,896. HU-1 aircraft hub assemblies. Fort Worth. Army Aviation Materiel Command, St. Louis.
—Flare-Northern Div., Atlantic Research Corp., West Hanover, Mass. $1,031,723. Bomb case and fuze assemblies. West Hanover. Edgewood Arsenal, Md.
—Universal Industries, Chicago. $1,018,750. Telephone terminals. Chicago. Army Electronics Command, Philadelphia.
—American Mfg. Co., Fort Worth, Tex. $1,476,300. 2.75 rocket warheads. Fort Worth. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Lehigh, Inc., Easton, Pa. $1,599,066. 2.75 rocket warheads. Easton. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Bulova Watch Co., Jackson Heights, N.Y. $1,338,900. 2.75 rocket fuzes. Woodside, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill.
—AVCO Corp., Richmond, Ind. $1,264,128. 2.75 rocket fuzes. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Hamilton Watch Co., Lancaster, Pa. $1,-296,841. 2.75 rocket fuzes. Lancaster. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Westclock Div., General Time Corp., LaSalle, Ill. $1,373,716. 2.75 rocket fuzes. LaSalle. Ammunition Procurement & Supply Agency, Joliet, Ill.
—KDI Corp., Cincinnati, Ohio. $1,235,807. 2.75 rocket fuzes. Cincinnati. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Olin Mathieson Chemical Corp., Associated Products Div., East Alton, Ill. $1,807,656. 81mm mortar fuzes. East Alton. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Olin Mathieson Chemical Corp., Associated Products Div., East Alton, Ill. $1,014,681. 81mm mortar illuminating shells. East Alton. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Chamberlain Corp., Waterloo, Iowa. $1,-364,460. Warhead metal parts. Waterloo. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Albion Malleable Iron Co., Albion, Mich. $1,169,015. Warhead metal parts. Albion. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Canadian Commercial Corp., Ottawa, Canada. $1,018,000. Warhead metal parts. Ingersal, Ontario, Canada. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Gibbs Mfg. & Research Corp., Janesville, Wis. $1,198,702. Rocket fuzes. Janesville. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Airport Machinery Corp., Martin, Tenn. $1,319,050. Warhead metal parts. Martin. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Bell Helicopter Co., Fort Worth, Tex. $2,714,000. Two UH-1L prototype helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.
—Motorola, Inc., Scottsdale, Ariz. $1,440,000. Radar data receiving and transmitting sets. Scottsdale. Army Electronics Command, Fort Monmouth, N.J.
—Cutler-Hammer, Inc., Deer Park, N.Y. $1,900,000. Radar sets, battery assemblies, field maintenance kits, test facility kits and ancillary items. Deer Park. Army Electronics Command, Fort Monmouth, N.J.
—Chamberlain Corp., Waterloo, Iowa. $2,-490,100. Warhead metal parts. Waterloo. Ammunition Procurement & Supply Agency, Joliet, Ill.
—American Hoist & Derrick Co., St. Paul, Minn. $6,292,800. Wheel-mounted 20-ton cranes. Fort Wayne, Ind. Army Mobility Equipment Center, St. Louis.

5—Herbert R. Imbt, Inc., and Nittany Materials, Inc., State College, Pa. $4,884,215. Work on the Blanchard Reservoir Project. Blanchard, Pa. Engineer Dist., Baltimore, Md.
—Kaiser-Jeep Corp., Toledo, Ohio. $2,742,-596. 436, various body types, 2½-ton trucks with Government furnished engines. South Bend, Ind. Army Mobility Command, Warren, Mich.

7—LaCrosse Dredging Corp., Chicago. $1,-493,862. Work on the Minnesota River Project. Near Minneapolis, Minn. Engineer Dist., St. Paul, Minn.
—Johnson Furnace Co., Bellevue, Ohio. $1,-793,710. 1½-ton cargo trailers. Bellevue. Army Tank Automotive Center, Warren, Mich.
—Stevens Mfg. Co., Edensburg, Pa. $1,572,-829. ¼-ton cargo trailers. Ebensburg. Army Tank Auotmotive Center, Warren, Mich.
—Continental Motors Corp., Muskegon, Mich. $1,091,197. Multi-fuel engines for the 5-ton truck. Muskegon. Army Mobility Command, Warren, Mich.
—Kaiser-Jeep Corp., Toledo, Ohio. $5,074,385. Five-ton trucks with Government furnished engines. South Bend, Ind. Army Mobility Command, Warren, Mich.
—Philco Corp., Newport Beach, Calif. $1,-093,552. Various quantities of spare parts for the SHILLELAGH missile system. Lawndale, Calif. Southwest Procurement Agency, Pasadena, Calif.
—Gibralter Mfg Co., Port Huron, Mich. $1,069,160. 15,565 wheel sprockets for various combat vehicles. Fort Huron. Army Tank Automotive Center, Warren, Mich.

8—Bell Helicopter Co., Fort Worth, Tex. $2,-688,180. Transmission assemblies and tail boom assemblies for the UH-1 helicopter. Fort Worth. Army Aviation Command, St. Louis.
—Hercules Powder Co., Wilmington, Del. $2,675,792. Miscellaneous propellants and explosives. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Collins Radio Co., Cedar Rapids, Iowa. $1,172,202. Miscellaneous repair parts and special tool lists for the AN/ARC-102 radio set. Cedar Rapids. Procurement Detachment, Chicago.
—Sylvania Electric Products, Needham, Mass. $2,500,000. Classified electronic equipment. Needham. Army Electronics Command, Fort Monmouth, N.J.

11—Marmont Corp., Saco, Maine. $1,130,664. M60 machine guns, and barrel and blpod assemblies. Saco. Army Weapons Command, Rock Island, Ill.
—U.S. Rubber Co., New York City. $2,411,-986. Various quantities of explosives and support services. Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Triden Electronics Co., South Pasadena, Calif. $1,250,000. Radio beacons and ancillary items. South Pasadena. Army Electronics Command, Philadelphia.
—Standard Products Corp., Cleveland, Ohio. $2,537,068. Track sections for the M114 personnel carrier. Port Clinton, Ohio. Army Tank Automotive Center, Warren, Mich.

12—Hamilton Watch Co., Lancaster, Pa. $1,-526,932. Mechanical time fuzes. Lancaster. Frankford Arsenal, Philadelphia.
—Bulova Watch Co., Woodside, N.Y. $1,-985,350. Mechanical time fuzes. Woodside. Frankford Arsenal, Philadelphia.
—Condec Corp., Stamford, Conn. $10,004,276. LARC V amphibious vehicles. Schenectady, N.Y. Army Mobility Equipment Center, St. Louis.

13—Raytheon Co., Lexington, Mass. $15,043,-446. Selected items of ground support and field maintenance equipment for the Hawk missile system. Andover, Mass. and Waltham, Mass. Army Missile Command, Huntsville, Ala.
—Raytheon Co., Lexington, Mass. $2,847,408. Guidance and control systems for the Hawk missile system. Andover, Mass. Army Missile Command, Huntsville, Ala.
—Chandler Evans, Inc., West Hartford, Conn. $3,114,000. Fuel control units for UH-1 helicopters. West Hartford. Army Aviation Command, St. Louis.
—Grumman Aircraft Engineering Corp., Beth Page, N.Y. $8,820,000. Production of OV-1C Mohawk aircraft. Beth Page. Army Aviation Materiel Command, St. Louis.
—LeTourneau-Westinghouse Co., Peoria, Ill. $5,247,000. 330 earth moving scrapers. Toccoa, Ga. Army Mobility Equipment Center, St. Louis.
—Philco Corp., Newport Beach, Calif. $2,-077,676. Grenade launchers and barrels. Anaheim, Calif. Army Weapons Command, Rock Island, Ill.
—Continental Motors Corp., Muskegon, Mich. $2,403,602. Engine assemblies with accessories for ¼-ton trucks. Muskegon. Army Mobility Command, Warren, Mich.
—Bell Helicopter Co., Fort Worth, Tex. $140,000,000. Continued production of UH 1B and UH-1D helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.
—Bell Helicopter Co., Fort Worth, Tex. $20,-420,000. UH-1H helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.

14—Hupp Corp., Canton, Ohio. $2,632,843. 2,996 ten-horsepower engines and 2,488 twenty-horsepower engines. Canton. Army Mobility Equipment Center, St. Louis.

15—Mason & Hanger—Silas Mason & Co., Inc., New York City. $2,393,877. Ordnance items and for operation and maintenance activities. Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Chamberlain Corp., Waterloo, Iowa. $2,-087,901. Metal parts for artillery projectiles. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.
—National Presto Industries, Eau Claire, Wis. $7,602,170. Metal parts and components for 8-inch projectiles. Eau Claire. Ammunition Procurement & Supply Agency, Joliet, Ill.
—RCA, Camden, N.J. $1,248,400. Radio sets and repair parts. Camden. Army Electronics Command, Philadelphia.
—Champion Co., Springfield, Ohio. $1,340,-023. Shipping and storage containers for bomb dispensers. Springfield. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Borg Warner Corp., Bellewood, Ill. $1,-600,000. Metallic belts for 20mm cartridges. Bellewood. Frankford Arsenal, Philadelphia.
—Vinnell Corp., Alhambra, Calif. $1,721,293. Design of an electrical land distribution system and procurement of all electrical material required for the system. Alhambra. Army Mobility Equipment Center, St. Louis.
—AVCO Corp., Stratford, Conn. $8,095,400. Modification kits for T53 engines, $1,121,-904. Rotor blades for T53 engines. Stratford. Army Aviation Materiel Command, St. Louis.
—Philco Corp., Newport Beach, Calif. $1,-689,460. Engineering services for the Chaparral Air Defense System. Newport Beach. Army Missile Command, Huntsville, Ala.
—Chamberlain Corp., Waterloo, Iowa. $6,-363,793. 175mm projectiles. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Chamberlain Corp., Waterloo, Iowa. $2,-404,455. 4.2-inch illuminating cartridge bodies. Waterloo. Ammunition Procurement & Supply Agency, Joliet, Ill.

18—Fenix & Scisson, Inc., Tulsa, Okla. $2,-670,469. Work on the Laurel River Reservoir, Kentucky, Project, Corbin, Ky. Engineer Dist., Nashville, Tenn.
—Mason & Hanger, Silas Mason & Co., Inc., New York City. $3,964,033. Various ordnance items. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Thiokol Chemical Corp., Bristol, Pa. $19,-093,947. Various quantities and types of illuminating cartridges and signals. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Ford Motors, Dearborn, Mich. $12,389,812. ¼-ton trucks. Highland Park, Mich. Army Mobility Equipment Center, Warren, Mich.
—Clark Equipment Co., Benton Harbor, Mich. $17,000,000. Industrial wheeled tractors. Benton Harbor. Army Mobility Equipment Center, St. Louis.
—AVCO Corp., Richmond, Ind. $1,421,460. Metal parts for 40mm projectiles. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Amron Corp., Waukesha, Wis. $1,971,384. 40mm cartridge cases. Waukesha. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Eisen Bros., Lodi, N.J. $2,686,189. 40mm projectile assemblies. Lodi. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Eastern Tool & Mfg. Co., Belleville, N.J. $1,478,538. 40mm metal parts. Belleville. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Burroughs Corp., Paoli, Pa. $1,600,000. Automatic message processing system and ancillary items. Paoli. Army Electronics Command, Fort Monmouth, N.J.
—Frank Briscoe Co., Newark, N.J. $5,602,-924. Construction of a field house with multi-purpose athletic facilities at the Air Force Academy, Colorado Springs, Colo. Engineer Dist., Omaha, Neb.

19—Carnegie Institute of Technology, Pittsburgh, Pa. $1,564,000. Research in language programming. Pittsburgh. Defense Supply Service, Washington, D.C.
—Zook Bros. Construction Co., Great Falls, Mont. $2,278,037. Excavation and clearing work on the Libby Dam Project, Libby, Mont. Engineer Dist., Seattle, Wash.
—Fruehauf Corp., Detroit, Mich. $5,108,840. 5,000-gallon fuel tank semi-trailers. Omaha, Neb. Army Tank Automotive Center, Warren, Mich.
—Walsh Construction Co., New York City and S. J. Groves and Sons Co., Minneapolis, Minn. $48,906,727. Tunnel construction and relocation work on the Libby Dam Project, Libby, Mont. Engineer Dist., Seattle, Wash.
—R. A. Heintz Construction Co., Portland, Ore. $4,947,191. Relocation and construction work on the Libby Dam Project, Libby, Mont. Engineer Dist., Seattle, Wash.
—Granite Construction Co., Watsonville, Calif. $3,415,546. Work on the Alameda Creek Project. Fremont, Calif. Engineer Dist., San Francisco.

20—Hughes Aircraft Co., Fullerton, Calif. $3,118,750. Radio sets with power supply and receiver transmitters with ancillary items. Fullerton. Army Electronics Command, Philadelphia.
—Bushman Construction Co., St. Joseph, Mo. $1,018,487. Work on the Elkhorn River Basin Flood Control Project. Norfolk, Neb. Engineer Dist., Omaha, Neb.
—Brandt Construction Co., and John H. Brandt, Lincoln, Neb. $1,447,604. Work on the main dam of the Branch Oak Reservoir Project, Lincoln, Neb. Engineer Dist., Omaha, Neb.
—Eugene Luhr and Co., Sacramento, Calif. $3,712,999. Work on the Redwood Channel Project. Orick, Calif. Engineer Dist., San Francisco.
—Western Electric Co., New York City. $2,750,000. NIKE HERCULES improved modification kits. Burlington, N.C. Army Missile Command, Huntsville, Ala.
—Marando, Inc., Washington, D.C. $1,896,-830. Construction of a four-story, 700 occupant enlisted women's barrack. Fort Myer, Va. Engineer Dist., Norfolk, Va.

21—Hercules Powder Co., Wilmington, Del. $9,312,152. 2.75-inch rocket propellant grains and operation and maintenance activities at the Sunflower Army Ammunition Plant, Lawrence, Kan. Ammunition Procureemnt & Supply Agency, Joliet, Ill.
—AVCO Corp., Cincinnati, Ohio. $3,662,385. Fixed-base mounted antennae. Cincinnati. Army Electronics Command, Philadelphia.
—Raytheon Co., Lexington, Mass. $1,004,115. Maintenance and modification of special tooling and test equipment to support HAWK missile systems. Andover, Mass. Army Missile Command, Huntsville, Ala.
—Baldwin Warren Co., San Francisco. $2,-057,696. Work on the Walnut Creek Channel Project, Contra Costa County, Calif. Engineer Dist., Sacramento, Calif.
—Guenther Mfg Co., Buchanan, N.Y. $1,-060,460. 18,703 cargo parachute releases. Buchanan. Army Aviation Materiel Command, St. Louis.
—Sperry Rand Corp., Phoenix, Ariz. $1,432,-275. Gyro magnetic compass sets with ancillary items. Phoenix. Army Electronics Command, Fort Monmouth, N.J.

22—AVCO Corp., Cincinnati, Ohio. $3,089,-755. 4,869 receiver transmitters with ancillary items. Evendale, Ohio. Army Electronics Command, Philadelphia.
—Stromberg Carlson Corp., Rochester, N.Y. $3,860,940. Sixteen fixed-plant telephone systems including installation, spares, commercial literature, maintenance tools and service tests. Rochester and Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.
—Continental Motors, Muskegon, Mich. $2,-425,000. Engines with containers for M60A1 and M48A3 tanks. Muskegon. Army Tank Automotive Center, Warren, Mich.
—Arundel Corp., Baltimore, Md. and L. E. Dixon Construction Co., San Gabriel, Calif. $17,195,034. Work on the Claiborne Lock and Dam Project, Claiborne, Ala. Engineer Dist., Mobile, Ala.
—Orr & Sembower, Reading, Pa. $4,026,621. 1,422 liquid dispensing tank and pump units for truck mounting. Reading. Army Mobility Equipment Center, St. Louis.
—H. B. Zachry Co., San Antonio, Tex. $2,-044,350. Facility requirement in support of expanded aviator training at 10 separate sites. Fort Wolters, Tex. Engineer Dist., Fort Worth, Tex.

25—Amos Construction Co., Oklahoma City, Okla. $2,276,421. Runway and taxiway construction and lighting. Sheppard AFB, Tex. Engineer Dist., Alburquerque, N.M.
—Poole & Kent Co., Miami, Fla. $1,036,000. Work on the C&S Florida Flood Control Project. Clewiston, Fla. Engineer Dist., Jacksonville, Fla.
—Troup Bros., Coral Gables, Fla. $1,073,185. Construction and excavation work on the C&S Florida Flood Control Project. Miami, Fla. Engineer Dist., Jacksonville, Fla.
—Basic Engineering & Construction Co., Logan, Utah. $1,466,527. Construction of a logistic and shop complex. Hill AFB, Utah. Engineer Dist., Sacramento, Calif.

26—Western Electric, New York City. $8,445,-257. Research and development in connection with the Nike X System. Whippany, N.J. and Redondo Beach, Calif. Nike X Project Office, Huntsville, Ala.
—Sperry Rand, New York City. $11,410,856. 155mm, 105mm and 75mm ammunition components. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.
—San Ore Construction Co., Gardner Engineering Corp., and DBA S.O.G. of Oklahoma, Houston, Tex. $19,750,378. Work on Webbers Falls Lock and Dam-Arkansas River, Oklahoma Project. Engineer Dist., Tulsa, Okla.
—Olin Mathieson Chemical Corp., East Alton, Ill. $1,321,537. Propellant for 20mm cartridges. East Alton. Frankford Arsenal, Philadelphia.
—Pace Corp., Memphis, Tenn. $4,167,857. Illuminating signals. Memphis. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Michael Harmonay Corp. and Raisler Corp., N.Y. $2,408,800. Work on the heating system for the new barracks at the U.S. Military Academy, West Point, N.Y. Engineer Dist., New York City.
—Allis Chalmers Mfg. Co., Birmingham, Ala. $2,020,000. Design, manufacture, delivery, installation and test of two generators for the Carters Dam and Reservoir, Coosawattee River, Ga., project. West Allis, Wis. and Carters, Ga. Engineer Dist., Mobile, Ala.
—Canadian Commercial Corp., Ottawa, Ontario, Canada. $1,408,836. Tube assemblies for ordnance items. Toronto. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Harvey Aluminum, Torrance, Calif. $2,-253,494. Ball projectiles for 20mm cartridges. Torrance. Frankford Arsenal, Philadelphia.
—Brown & Root, Inc., Houston, Tex. $1,-972,000. Expanded aviator training facilities at Mineral Wells Airport consisting of hanger, aprons, aircraft park and POL facilities at Fort Wolters, Tex. Engineer Dist., Fort Worth, Tex.

27—Action Mfg. Co., Philadelphia. $1,443,606. 90mm anti-tank projectile fuzes. Philadelphia. Army Ammunition Procurement & Supply Agency, Joliet, Ill.
—Philco Corp., Communications & Electronics Div., Willow Grove, Pa. $5,000,000. Automatic digital message switching centers. Willow Grove. Army Electronics Command, Fort Monmouth, N.J.
—Guy F. Atkinson Co., Long Beach, Calif. $4,976,405. Construction on Coyote Creek Channel, Los Angeles County, Calif. Buena Vista, Calif. Engineer Dist., Los Angeles.
—S. J. Groves & Sons Co., Springfield, Ill. $11,617,104. Construction on Shelbyville Reservoir project, Kaskaskia River, Ill. Shelbyville, Ill. Engineer Dist., St. Louis.
—Colt's Inc., Hartford, Conn. $1,224,000. M-16 and XM16E1 rifle magazines. Hartford. Army Weapons Command, Rock Island, Ill.
—General Cable Corp., New York City $4,-225,240. Cable assemblies. Roselle, N.Y. Army Electronics Command, Fort Monmouth, N.J.
—Gibbs Mfg. & Research Corp., Janesville, Wis. $1,551,818. 2.75 rocket fuzes. Janesville. Ammunition Procurement & Supply Agency, Joliet, Ill.
—KDI Corp., Cincinnati, Ohio. $1,547,371. 2.75 rocket fuzes. Cincinnati. Ammunition Procurement & Supply Agency, Joliet, Ill.

28—Pfend & Brown, Inc., Milford, Ind. $1,040,-476. Work on the Salamonie Reservoir project. Wabash, Ind. Engineer Dist., Louisville, Ky.
—AVCO Corp., Stratford, Conn. $3,203,000. Repair parts for helicopter gas turbine engines. Stratford. Army Aviation Materiel Command, St. Louis.
—General Motors, Diesel Engine Div., Detroit. $1,768,508. Six cylinder engines. Detroit. Army Automotive Center, Warren, Mich.
—Western Electric Co., New York City. $1,-106,944. Nike-Hercules research and development services. Burlington, N.C. Army Missile Command, Huntsville, Ala.
—I.D. Precision Components Corp., Jamaica, N.Y. $1,144,000. 81mm mortar fuzes. Jamaica. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Wilkinson Mfg. Co., Fort Calhoun, Neb. $1,192,400. 81mm mortar fuzes. Fort Calhoun. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Action Mfg. Co., Philadelphia. $1,218,800. 81mm mortar fuzes. Philadelphia. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Columbus Milpar & Mfg. Co., Columbus, Ohio. $1,164,000. 81mm mortar fuzes. Westerville, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill.
—REDM Corp., Wayne, N.J. $1,210,000. 81mm mortar fuzes. Wayne. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Grand Machining Co., Detroit. $1,751,680. 81mm mortar fin assemblies. Vero Beach, Fla. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Albion Malleable Iron Co., Albion, Mich. $1,386,180. Projectile body assemblies. Albion. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Wagner Electric Co., St. Louis. $2,088,270. 4.2" mortar projectiles. St. Louis. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Kennedy Van Saun Corp., Danville, Pa. $2,528,940. 4.2" mortar projectiles. Danville. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Specialty Electronics Development Corp., Glendale, N.Y. $1,284,088. Telephone sets. South Bridge, Mass. Army Electronics Command, Philadelphia.
—Bunker Ramo Corp., Canoga Park, Calif. $1,088,322. Universal automatic map compilation system. Canoga Park. Army Map Service, Corps of Engineers, Washington, D.C.
—Vinnell Corp., Alhambra, Calif. $1,750,000. Construction and operation of a fourth echelon maintenance depot and floating dry dock. Southeast Asia. Army Mobility Equipment Center, St. Louis.

—Baldwin Electronics Inc., Little Rock, Ark. $1,225,115. 2.75" rocket motors. Camden, Ark. Ammunition Procurement & Supply Agency, Joliet, Ill.

29—Day & Zimmerman, Inc., Philadelphia. $9,-203,142. Miscellaneous ammunition parts and items. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Harvey Aluminum Sales, Inc., Torrance, Calif. $2,871,930. 105mm, 106mm, 40mm, 81mm shells, and miscellaneous ammunition items. Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Atlas Chemical Industries, Inc., Wilmington, Del. $10,120,703. Explosives. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Conductrom Corp., Ann Arbor, Mich. $1,-000,000. Classified research and development. Ann Arbor. Army Missile Command, Huntsville, Ala.

—Hercules Powder Co., Wilmington, Del. $3,939,262. Miscellaneous propellant explosives. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Sylvania Electronics Products, Inc., Needham, Mass. $1,000,000. Electronic equipment. Needham. Army Electronics Command, Fort Monmouth, N.J.

—Global Construction, Altadena, Calif. $1,-758,161. Construction at Vandenburg AFB, Calif. Engineer Dist., Los Angeles.

—Belock Instrument Corp., College Point, N.Y. $1,968,000. HAWK simulator trainers. College Point. Army Missile Command, Huntsville, Ala.

—Hughes Tool Co., Culver City, Calif. $1,-800,000. Armament sub-systems. Culver City. Army Weapons Command, Rock Island, Ill.

—Philco Corp., Newport Beach, Calif. $1,-225,550. Chaparral inspection equipment. Newport Beach. Army Missile Command, Huntsville, Ala.

—Chrysler Corp., Marysville, Mich. $1,159,-873. M113 family engines. Marysville. Army Automotive Center, Warren, Mich.

—FMC Corp., San Jose, Calif. $15,000,000. Vehicles of the M113 family, and related kits. South Charleston, W. Va. Army Automobile Center, Warren, Mich.

—Collins Radio Co., Cedar Rapids, Iowa. $3,418,191. Direction finders. Cedar Rapids. Army Electronics Command, Fort Monmouth, N.J.

—New Mexico State University, University Park, N.M. $1,117,228. Data reduction and computer services. University Park. White Sands Missile Range, N.M.

—Chrysler Corp., Detroit. $3,668,905. Engine assemblies with containers. Marysville, Mich. Army Automotive Center, Warren, Mich.

—General Motors, Allison Div., Indianapolis, Ind. $1,656,985. Various types of transmissions. Indianapolis. Army Automotive Center, Warren, Mich.

—Raytheon Co., Burlington, Mass. $2,863,-633. Radio communications equipment. Hawthorne, Calif. Army Electronics Command, Philadelphia.

—RCA, Camden, N.J. $8,096,400. Radio sets. Camden. Army Electronics Command, Philadelphia.

—LeTourneau-Westinghouse Co., Peoria, Ill. $3,849,958. Diesel engine road graders. Indianapolis, Ind. Army Mobility Equipment Center, St. Louis.

—Canadian Commercial Corp., Ottawa, Canada. $1,597,500. 2.75" rocket warheads. Dundas, Ontario, Canada. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Canadian Commercial Corp., Ottawa, Canada. $1,712,250. 2.75" rocket warheads. Sarnia, Canada. Ammunition Procurement & Supply Agency, Joliet, Ill.

NAVY

1—Carrier Air Conditioning Co., New York City, $1,045,275. Air conditioners for shipboard use. Syracuse, N.Y. Bureau of Ships.

—United Boatbuilders, Bellingham, Wash. $1,580,000. Construction of 40 plastic river patrol boats. Bellingham. Bureau of Ships.

—M.I.T., Instrumentation Laboratory, Cambridge, Mass. $1,000,000. Design and development of the Poseidon missile guidance system. Cambridge. Special Projects Office.

—Standard Products Co., Cleveland, Ohio. $3,000,000. Eight 129 track section repair kits. Port Clinton, Ohio. Marine Corps.

4—General Precision, Inc., Librascope Group, Glendale, Calif. $2,524,028. Torpedo fire control system components. Glendale. Bureau of Naval Weapons.

—LTV Aerospace Corp., Vought Aeronautics Div., Dallas, Tex. $7,128,205. A-7-A aircraft. Dallas. Bureau of Naval Weapons.

—Eclipse Pioneer Div., Bendix Corp., Teterboro, N.J. $2,904,458. Major components for automatic flight control systems used on A-4-E/TA-4-E aircraft. Teterboro. Navy Aviation Supply Office, Philadelphia.

—Stelma, Inc., Stamford, Conn. $3,011,197. Telegraph terminal equipment for naval communications. Stamford. Navy Purchasing Office, Washington, D.C.

—Westinghouse Electric Corp., Sunnyvale, Calif. $1,000,000. Development of the Poseidon missile launcher system. Sunnyvale. Special Projects Office.

—Thiokol Chemical Corp., Reaction Motors Div., Denville, N.J. $1,828,950. Bullpup rocket engines. Rockaway, N.J. Bureau of Naval Weapons.

5—United Aircraft, Stratford, Conn. $16,923,-800. CH-53A helicopters. Stratford. Bureau of Naval Weapons.

—ITT Gilfillan Co., Los Angeles. $1,325,000. Radar landing systems for installation aboard aircraft carriers. Los Angeles. Bureau of Ships.

7—Pacific Ship Repair, Inc., San Francisco. $1,220,000. Topside overhaul and repair of the ammunition ship USS RAINIER (AE-5). San Francisco. Industrial Manager, 12th Naval Dist.

—Chromcraft Corp., St. Louis. $4,707,000. Production of rocket launchers. St. Louis. Bureau of Naval Weapons.

—Sanders Associates, Nashua, N.H. $4,441,-880. Basic engineering and development of an air dropable ASW sonobuoy system. Nashua. Bureau of Naval Weapons.

—Magnavox Co., Fort Wayne, Ind. $4,111,-764. Basic engineering and development of an air droppable ASW sonobuoy system. Fort Wayne. Bureau of Naval Weapons.

—Aerojet General Corp., Sacramento, Calif. $1,877,600. Nitroplasticizer for POLARIS A-3 missiles. Sacramento. Special Projects Office.

—Aluminum Specialty Co., Manitowoc, Wis. $2,834,784. 20mm link cartridge disintegrating belts used for lending 20mm ammunition. Manitowoc. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Hazeltine Corp., Little Neck, N.Y. $3,962,-122. Sonar transducers for installation aboard naval ships. Braintree, Mass. and Little Neck. Bureau of Ships.

—Aluminum Shapes, Inc., Delair, N.J. $1,-225,319. AM-2 aluminum extrusions for airfields. Delair. Naval Air Engineering Center, Philadelphia.

—May Aluminum, Inc., El Campo, Tex. $2,-164,326. AM-2 aluminum extrusions for airfields. El Campo. Naval Air Engineering Center, Philadelphia.

—Kaiser Aluminum & Chemical Sales, Inc. Halethorpe, Md. $2,473,999. AM-2 aluminum extrusions for airfields. Halethorpe. Naval Air Engineering Center, Philadelphia.

—Southern Extrusions, Inc., Magnolia, Ark. $1,462,230. AM-2 aluminum extrusions for airfields. Magnolia. Naval Air Engineering Center, Philadelphia.

8—Magnavox Co., Fort Wayne Ind. $1,780,-300. Classified project. Bureau of Naval Weapons.

11—Teletype Corp., Skokie, Ill. $2,243,022. Teletype equipment for installation aboard surface ships. Skokie. Bureau of Ships.

—General Motors, LaGrange, Ill. $3,934,700. Non-magnetic propulsion diesel engines for ocean minesweepers. McCook, Ill. Bureau of Ships.

—Westinghouse Electric, Baltimore, Md. $3,-800,000. Long lead time items and effort for procurement of airborne radar sets for the Air Force. Baltimore. Bureau of Naval Weapons.

—Stewart-Warner Corp., Chicago. $1,548,308. Components for the ARN-52 aircraft navigational set. Chicago. Navy Purchasing Office, Washington, D.C.

12—Universal Match Corp., Ferguson, Mo. $3,-461,949. Launching groups and a control panel to be installed on ships for missile launching. Ferguson. Navy Purchasing Office, Washington, D.C.

—United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $1,005,140. Miscellaneous spare parts for the J-57 engine used on B-52 and KC-135 aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

13—George Washington University, Washington, D.C. $1,127,000. Research on logistics computer services. Washington, D.C. Office of Naval Research, Washington, D.C.

14—Douglas Aircraft, Long Beach, Calif. $1,-700,000. TA-4E aircraft. Long Beach. Bureau of Naval Weapons.

—Douglas Aircraft, Long Beach, Calif. $1,-477,271. Ejector racks and related equipment. Torrance, Calif. Bureau of Naval Weapons.

—General Dynamics, Electric Boat Div., Groton, Conn. $1,147,927. Installation of fleet ballistic missile submarine training equipment. New London, Conn. Bureau of Ships.

—United Aircraft, East Hartford, Conn. $2,-970,208. J52-P8A engines. East Hartford. Bureau of Naval Weapons.

—United Aircraft, East Hartford, Conn. $1,-030,455. Miscellaneous spare parts for J48-T8/8A engines for F-9F aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia.

15—Bunker-Ramo Corp., Canoga Park, Calif. $4,000,000. Classified electronic equipment. Silver Spring, Md. and Canoga Park. Bureau of Naval Weapons.

—General Electric, Johnson City, N. Y. $3,-027,690. Automatic flight control systems and related equipment for the Air Force. Johnson City. Bureau of Naval Weapons.

18—General Dynamics, Electric Boat Div., Groton, Conn. $36,427,000. Construction of a submarine tender. Groton. Bureau of Ships.

—General Precision, Inc., Glendale, Calif. $2,803,683. Fire control system for the MK 48 torpedo. Glendale. Bureau of Naval Weapons.

19—Sanders Associates, Nashua, N. H. $2,-943,000. Research and development of pod-mounted noise jammers for Navy aircraft. Nashua. Bureau of Naval Weapons.

—Stanford Research Institute, Menlo Park, Calif. $1,195,765. Additional naval operations research. Office of Naval Research.

—General Motors, Milwaukee, Wis. $3,981,-215. Design, development and fabrication of two prototype ship's self-contained navigation systems for test and evaluation by the Navy. Milwaukee. Bureau of Ships.

20—Bermite Powder Co., Saugus, Calif. $4,-218,000. JATO rocket motors for aircraft. Saugus. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Grumman Aircraft Engineering Corp., Bethpage, N. Y. $6,300,104. Long lead time effort for FY 66 procurement of A-6A aircraft. Bethpage. Bureau of Naval Weapons.

—Sperry Rand Corp., St. Paul, Minn. $2,-076,486. Radar fire-control equipment with associated material and engineering services. St. Paul. Bureau of Ships.

21—United Aircraft, Stratford, Conn. $9,123,-800. CH-3E and HH-3E helicopters for the Air Force. Stratford. Bureau of Naval Weapons.

—Borg Warner Corp., Chicago. $1,685,500. Machine tools in support of the MK 81 bomb production program. Chicago. Bureau of Naval Weapons.

—American Electric, Inc., Paramount, Calif. $1,000,320. Mark 77 fire bombs. Paramount. Navy Ordnance Plant, Louisville, Ky.

—Conco Engineering Works, Mendota, Ill. $1,156,800. Mark 77 fire bombs. Mendota. Navy Ordnance Plant, Louisville, Ky.

—Curtiss-Wright Corp., Wood-Ridge, N. J. 3,004,300. Kits to support J65-W16 engines for A-4B/C aircraft. Wood-Ridge. Navy Aviation Supply Office, Philadelphia.

—General Electric, Cincinnati, Ohio. $6,013,-192. Spare parts for J79-GE10 engines to support F-4J aircraft. Cincinnati. Navy Aviation Supply Office, Philadelphia.

22—Boeing Co., Morton, Pa. $2,478,080. Rotor blade droop snoots for use on CH/UH-46 helicopters. Morton. Navy Aviation Supply Office, Philadelphia.

26—Johns Hopkins University, Silver Spring, Md. $1,298,500. Research and development work for the Army and ARPA (Advanced Research Projects Agency). Silver Spring. Bureau of Naval Weapons.

—Marlo Coil Co., St. Louis. $2,057,023. Air conditioning equipment for naval ships. St. Louis. Bureau of Ships.

27—U.S. Steel Corp., Pittsburgh, Pa. $13,181,-170. Mark 82 bomb bodies. $8,076,780. Mark 82 bomb bodies. $9,267,830. Mark 81 bomb bodies. McKeesport, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—American Mfg. Co., Fort Worth, Tex.

$2,829,897. Mark 82 bomb bodies. $6,520,500. Mark 82 bomb bodies. Fort Worth. Navy Ships Parts Control Center, Mechanicsburg, Pa.
—Grumman Aircraft Engineering Corp., Bethpage, N. Y. $5,525,00. Long lead time effort for planned FY 66 and FY 67 procurement of C-2A aircraft. $11,156,929. Increase long lead time effort for FY 66 procurement of A-6-A weapon systems. Bethpage. Bureau of Naval Weapons.
—Norris-Thermidor Corp., Los Angeles. $8,490,017. Mark 81 bomb bodies. $7,056,443. Mark 82 bomb bodies. Los Angeles. Navy Ships Parts Control Center, Mechanicsburg, Pa.
—Intercontinental Mfg. Co., Garland, Tex. $7,129,020. Mark 82 bomb bodies. Garland. Navy Ships Parts Control Center, Mechanicsburg, Pa.
—United Aircraft, Hamilton Standard Div., Windsor Locks, Conn. $2,118,048. Propeller systems for C-130 aircraft. Windsor Locks. Bureau of Naval Weapons.
—AiResearch Mfg. Co. of Arizona, division of Garrett Corp., Phoenix, Ariz. $1,252,015. Main parts for GTC95-2 power units for use in P-3-A aircraft. Phoenix. Navy Aviation Supply Office, Philadelphia.
—American Machinery & Foundry Co., York, Pa. $15,970,500. Mark 82 bomb bodies. York. Navy Ships Parts Control Center, Mechanicsburg, Pa.
—Loral Electronics Systems Div., Loral Corp., Bronx, N. Y. $2,327,893. Components of doppler navigation radar sets for use on A-6 and P-3-A aircraft. Bronx. Navy Purchasing Office, Washington, D.C.
—Litton Systems, Westrex Communications Div., New Rochelle, N. Y. $1,019,473. Tropospheric scatter communication system. Navy Purchasing Office, Washington, D.C.
—Litton Systems, Westrex Communications Div., New Rochelle, N.Y. $1,019,473. Tropospheric scatter communication system. Navy Purchasing Office, Washington, D.C.
—Borg-Warner Corp., Ingersoll Products Div., Chicago. $13,858,000. Mark 81 bomb bodies. Chicago. Navy Ships Parts Control Center, Mechanicsburg, Pa.
28—Curtiss Wright Corp., Wright Aeronautical Div., Wood-Ridge, N. J. $2,277,608. Spare parts to suport the J65, R3350 and R1820 engines for installation in various Navy aircraft. Wood-Ridge. Navy Aviation Supply Office, Philadelphia.
29—Gyrodyne Company of America, Flowerfield, St. James, N. Y. $2,500,000. QH-50 drone helicopters. St. James. Bureau of Naval Weapons.
—Avondale Shipyards, New Orleans. $3,200,000. Aviation and repair of the hospital ship USS Sanctuary (AH-17). New Orleans. Bureau of Ships.

AIR FORCE

1—Magnavox Co., Fort Wayne, Ind. $1,820,969. Production of aircraft radio sets. Fort Wayne. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Hazeltine Corp., Little Neck, N. Y. $2,948,195. Production of aircraft communication equipment. Little Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Lockheed Missiles & Space Co., Sunnyvale, Calif. $2,400,000. AGENA rocket launch services for 1966. Cocoa Beach, Fla. Space Systems Div. (AFSC), Los Angeles.
—General Electric, West Lynn, Mass. $3,000,000. Component improvement engineering program for the J-85 aircraft engine. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Goodyear Tire & Rubber Co., Akron, Ohio. $1,125,997. Wheel and brake assemblies for C-123 aircraft. Akron. Ogden Air Materiel Area (AFSC), Hill AFB, Utah.
—Chicago Aerial Industries, Barrington, Ill. $1,200,000. Production of aircraft camera systems. Barrington. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
4—Maxson Electronics Corp., Great River, N. Y. $1,738,257. Production of fuze assemblies for aircraft bombs. Macon, Ga. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.
—Continental Aviation & Engineering Corp., Detroit. $2,102,800. J-69 engines for target drone aircraft. Toledo, Ohio. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Federal Electric Corp., Richland, Wash. $1,979,760. Production of generator sets. Pasco, Wash. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.
—Raytheon Co., Space & Information Systems Div., Waltham, Mass. $2,924,000. Modification of the bomb-navigation system of the B-58 bomber. Waltham. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.
—Sperry Gyroscope Co., Great Neck, N. Y. $1,090,000. Modification of the bomb navigation system of the B-58 bomber. Great Neck. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.
5—Sanders Associates, Nashua, N.H. $1,600,000. Production of airborne radio direction finding equipment. Nashua. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Sperry Rand Corp., Great Neck, N. Y. $1,699,398. Production of components for LORAN navigational equipment. Great Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Libby Welding Co., Kansas City, Mo. $1,244,581. Production of 160 generator sets. Kansas City. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.
—General Dynamics, Fort Worth, Tex. $3,046,317. Inspection and repair of B-58 aircraft. Fort Worth. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.
—Lear Siegler, Inc., Grand Rapids, Mich. $3,251,536. Production of aircraft bombing computer sets. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
6—AVCO Corp., Stratford, Conn. $1,200,000. Work on the Mark IIA re-entry vehicle. Stratford. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
—Boeing Co., Wichita, Kan. $10,255,493. Modification and maintenance of vertical tail fins for B-52 aircraft. Wichita. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
—Bendix Corp., Baltimore, Md. $1,205,798. Weather radar systems. Baltimore. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.
—Stewart & Stevenson Services, Houston, Tex. $1,351,302. Production of electrical power generators. Houston. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.
7—AVCO Corp., New York City. $3,500,000. Research, development and production of the MARK 17 re-entry vehicle system. Wilmington, Mass. and Stratford, Conn. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
—Kollsman Instrument Corp., Elmhurst, N.Y. $2,570,986. Production of flight instrumentes for C-141 aircraft. Elmhurst. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Bendix Corp., Teterboro, N. J. $2,830,202. Production of flight instruments for C-141 aircraft. Teterboro. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Stewart Warner Corp., Chicago. $1,003,995. Production of components for aircraft radar altimeters. Chicago. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
8—Martin Marietta, Denver, Colo. $7,568,000. Design, development, fabrication and delivery of a TITAN III space booster and associated equipment. Denver Space Systems Div. (AFSC), Los Angeles.
—TRW, Inc., Redondo Beach, Calif. $1,200,000. Production of airborne tactical reconnaissance equipment. Redondo Beach. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
11—McDonnell Aircraft, St. Louis. $2,000,000. Work on the Manned Orbiting Laboratory program. St. Louis. Space Systems Div. (AFSC), Los Angeles.
12—Ward LaFrance Truck Corp., Elmira Heights, N. Y. $1,782,472. Production of 66 aircraft towing tractors. Elmira Heights. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.
—A. G. Bartlett Co., Tulsa, Okla. $1,358,803. Conduct of base operations and maintenance services. Chandler, Ariz. Williams AFB, Chandler, Ariz.
—Switlik Parachute Co., Trenton, N. J. $1,060,000. Production of cargo-type parachutes. Trenton. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.
—Curtiss Wright Corp., Wood-Ridge, N. J. $1,020,887. Production of H-34 helicopter engines. Wood-Ridge. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.
13—University of Illinois, Urbana, Ill. $2,000,000. Development of a parallel processing computer. Urbana. Rome Air Development Center (AFSC), Griffiss AFB, N. Y.
—General Dynamics Corp., San Diego, Calif. $1,153,642. Procurement of spare parts in support of the ATLAS/AGENA booster program. San Diego. Space Systems Div. (AFSC), Los Angeles.
—Litton Systems Inc., Woodland Hills, Calif. $7,111,630. Production of electronic equipment for F-4D and F-4E aircraft. Salt Lake City, Utah and Duluth, Minn. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
—Lockheed Aircraft, Sunnyvale, Calif. $6,505,000. Work on the GEMINI program target vehicle system. Sunnyvale. Space Systems Div. (AFSC), Los Angeles.
—Boeing Co., Wichita, Kan. $1,408,100. Investigation of aircraft response to low-level critical air turbulence. Wichita. Systems Engineering Group, Research & Technology Div. (AFSC), Wright-Patterson AFB, Ohio.
15—Garrett Corp., Torrance, Calif. $2,729,625. Production of F-4D aircraft components. Los Angeles. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
—Sperry Rand Corp., Great Neck, N. Y. $4,320,000. Production of components for LORAN navigational equipment. Great Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—General Electric, West Lynn, Mass. $3,068,492. Expansion of engine production facilities. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
18—A. J. Industries, Inc., El Monte, Calif. $2,104,479. Production of 450 and 650-gallon wing fuel tanks for F-105 aircraft. El Monte. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
19—Goodyear Tire & Rubber Co., Akron, Ohio. $1,484,964. Wheels and brakes for C-141A aircraft. Akron. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
20—Litton Systems, Inc., Woodland Hills, Calif. $8,552,854. Avionics subsystems for F-4 aircraft. Woodland Hills. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Lear Siegler, Inc., Grand Rapids, Mich. $1,007,818. Procurement of aircraft instruments for C-130 and T-38 aircraft. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Goodyear Aerospace Corp., Akron, Ohio. $1,363,600. Protective armor for C-130 aircraft. Akron. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.
—Hughes Aircraft, Fullerton, Calif. $6,750,000. An advanced radar system. Fullerton. Rome Air Development Center (AFSC), Griffiss AFB, N. Y.
22—General Electric, Johnson City, N. Y. $3,019,000. Gun sights for F-4 aircraft. Johnson City. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Hycon Mfg. Co., Monrovia, Calif. $2,500,000. KS-72 camera systems. Monrovia. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
25—Olin Mathieson Chemical Corp., East Alton, Ill. $1,703,860. Cartridge-type engine starters for B-52, KC-135 and F-4 aircraft. East Alton. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Lockheed Aircraft, Jamaica, N. Y. $1,640,000. Modification of C-121 aircraft. Jamaica. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.
—Aerojet-General Corp., Sacramento, Calif. $2,069,340. Procurement of solid-propellant rocket motors for the ATHENA program. Sacramento. Ballistic Systems Div. (AFSC), Norton AFB, Calif.
—Douglas Aircraft, Santa Monica, Calif. $1,059,750. Modernization of aerospace ground equipment. Santa Monica and Vandenberg AFB, Calif. Space Systems Div. (AFSC), Los Angeles.
26—Servo Corp. of America, Hicksville, N. Y. $1,531,412. Direction finder sets. Hicksville. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.
—Lockheed Aircraft, Marietta, Ga. $1,035,920. Technical data for the C-141A aircraft. Marietta. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.
—North American Aviation, Anaheim, Calif. $1,851,000. Maintenance and repair of

Minuteman guidance and control equipment. Anaheim. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—Litton Systems, New Rochelle, N. Y. $3,444,748. Spare parts for a world wide high power ground-to-air communications system. New Rochelle. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—General Electric, Philadelphia. $7,500,000. Research and development on the Mark 12 reentry program. Philadelphia. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

27—General Electric, West Lynn, Mass. $1,103,000. Component improvement program for J-85 aircraft engines. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Boeing Co., Morton, Pa. $18,620,500. Production of CH-47A helicopters. Morton. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—AiResearch Mfg. Co., Phoenix, Ariz. $2,728,000. Production of gas turbine engines. Phoenix. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

28 United Aircraft, East Hartford, Conn. $1,516,364. Production of components for J-57 and T-34 aircraft engines. East Hartford. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—AVCO Corp., Stratford, Conn. $1,648,468. Additional production equipment at Air Force Plant 43, Stratford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

29 McDonnell Aircraft Corp., St. Louis. $2,071,882. Work on the Gemini spacecraft heat shield, for the Manned Orbiting Laboratory. St. Louis. Space Systems Div. (AFSC), Los Angeles.

Navy Sets Reliability Policy

The Secretary of the Navy has released a policy directive setting forth the Navy's requirements in regard to reliability of Naval material.

The new instruction, SECNAV Instruction 3900.36, dated Jan. 27, 1966, directs Navy and Marine Corps procurement offices to incorporate reliability provisions, including quantitative requirements in all specifications, exhibits, product descriptions, work statements and contractual clauses to be referred to or included in contracts for systems and associated material.

Also included in the policy instruction is the requirement that major consideration in all source selection action be given to contractor's reliability capability in both past performance and proposed programs.

Atmospheric Test Chamber in Operation by AF Laboratory

The Air Force Cambridge Research Laboratories have placed in operation an environment test chamber for simulating atmospheric pressures and temperatures found at altitudes up to 210,000 feet.

The chamber is being used to test, adjust, and calibrate balloon-borne instruments at various simulated altitudes. It can simulate atmospheric temperatures and pressures for flights of any duration, including atmospheric conditions at launch and ascent, at float altitudes, and descent.

Dr. Walter Wagner of the Aerospace Instrumentation Laboratory designed the test facility which was built by Tenney Engineering, Inc., of Union, N. J.

Configuration Management

(Continued from Page 3)

cation incompatibilities. At the time of delivery from the breakout contractor, the configuration records are used to define the "as-shipped" configuration.

Field Configuration Record. After delivery of equipment from a Pershing contractor's facility, detailed configuration definition must be maintained throughout the equipment service life. This is particularly important where significant quantities of equipment are deployed in such a manner that substitution and reallocation may take place without serious system performance problems. It became apparent early in the Pershing program that equipment must be modified in a manageable block in lieu of being updated on an individual, piecemeal basis. This was accomplished through a planned modification program utilizing contractor personnel.

For the Pershing Improved Programmer Test Station Program, a field configuration record system is being developed that will accomplish the same effect as the production configuration record, except that it will compare the as-built configuration to field configuration. Included in this comparison will be the exact status of the hardware configuration and all outstanding modifications—that is, those that have been planned for incorporation but have not been physically installed. The feedback system to show installation of modification kits will be accomplished utilizing the Army TAERS log system and associated Form 2407. Information will be available showing modifications required, modifications installed and modifications outstanding. This information can be made available for individual equipment serial numbers, blocks or lots of serial numbers, or the total deployed weapon system.

The configuration accounting techniques described above provide control of definition of hardware items from the initial engineering release and throughout production and field support of the system. This mechanized control provides greater simplification and the ability to handle extremely large quantities of data in a more timely manner than the manual means previously employed. Special information to resolve specific problems can be retrieved from the mechanized data file expeditiously in lieu of the previous method of using a large amount of manually prepared data requiring extensive research to solve specific problems.

Full impact of this program has not yet been felt; however, we now feel that all Pershing configurations in the field are defined.

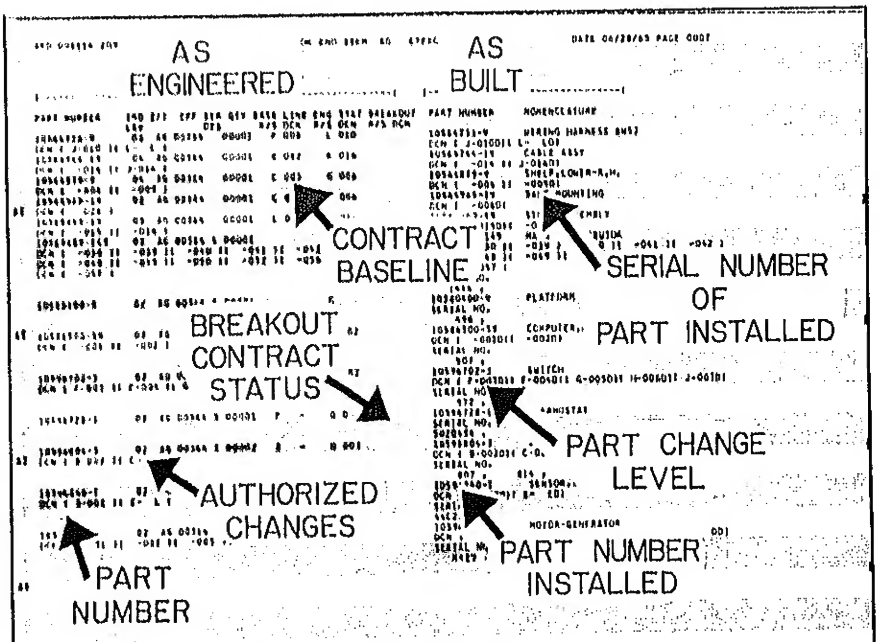


FIGURE 4

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Air Force Funds 319 Unsolicited Proposals in First Half of FY 1966

The U.S. Air Force accepted and funded at a cost of $18.5 million more than one-fourth of the unsolicited proposals it received from the industrial and scientific community during the first half of FY 1966.

Of the 1,189 proposals given consideration, 319 were accepted topping the average number accepted during each of the past three full years. There has been a steady increase in both acceptances and fundings of unsolicited proposals since FY 1963 when only slightly more than seven percent were bought at a cost of $14.3 million. The number of voluntary proposals submitted has remained relatively stable each year. Since less average time has been spent evaluating unsolicited proposals this year, Air Force officials attribute the upswing in acceptance to the merits of the current proposals.

Major General Gerald F. Keeling, Deputy Chief of Staff for Procurement and Production, Air Force Systems Command, stated that unsolicited proposals are encouraged because they often represent an unexplored potential of scientific ingenuity and creative talent in individuals, universities, non-profit research agencies and industrial firms not normally dealing with the Air Force. "Many new firms, particularly small ones who would never have an opportunity to prove their worth otherwise, are able to establish their capabilities and qualifications through unsolicited proposals," said General Keeling. "We don't care about the size of a firm; it's the competence of its people that interests us. We welcome the opportunity to evaluate any ideas they have which might help us accomplish our mission of producing qualitatively superior aerospace systems."

To facilitate the submission of unsolicited proposals, a "Guide for Voluntary Unsolicited Proposals" has been prepared by the Systems Command. The guide tells where, when and how to submit a proposal. Names, mailing addresses and telephone numbers of responsible persons at focal points within Systems Command divisions, centers, ranges and laboratories are listed in the guide, and a brief description of the technical areas and scientific disciplines monitored by each of these persons is included.

A copy of the guide may be obtained from any Systems Command activity or write to Headquarters, Air Force Systems Command, Attention: SCKAE, Andrews AFB, Washington, D. C. 20331.

Oceanographic Study Results Published

The results of a study concerning problems encountered in the analysis of wave energy have been released by the U.S. Naval Oceanographic Office in a booklet titled, "Wave Hindcast Project North Atlantic Ocean (TR–183)."

From the information compiled it is hoped that specific predictions of deck motion can be applied to aircraft carrier landings. The project utilized numerical prediction techniques on a high-speed electronic computer. The input consisted of raw weather information to derive the surface wind direction and speed patterns over the ocean. This knowledge was further used as input to a highly complex computer program which describes wave direction and height by time interval between successive wave features.

The Bureau of Naval Weapons conducted the project with the assistance of the Travelers Research Center, New York University and the Lockheed-California Co.

The compiled results of the study, publication number TR–183, can be obtained for 75 cents from the U.S. Naval Oceanographic Office, Washington, D. C. 20390.

DEFENSE INDUSTRY
BULLETIN

Volume 2, No. 6 June 19

C-7

IN THIS ISSUE

DEPARTMENTS

DEPARTMENT OF DEFENSE

ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

"The decisive factor for a powerful nation . . . *is* the character of its relationship with the world . . ."

Hon. Robert S. McNamara

"First, we have to help protect those developing countries which ge-inely need and request our help, and which—as an essential pre-conditio are willing and able to help themselves.

"Second, we have to encourage and achieve a more effective partners with those nations who can and should share international peace-keep responsibilities.

"Third, we must do all we realistically can to reduce the risk of conf with those who might be tempted to take up arms against us."

The foregoing is quoted from an address by the Secretary of Defe before the American Society of Newspaper Editors, May 18, 1966, Montreal, Canada. The entire speech is reprinted in this issue of *Defense Industry Bulletin* beginning on page 1.

Summer Job Program Announced by Sec. Def. McNamara

For the second consecutive year, Secretary of Defense Robert S. McNamara has ordered the establishment of additional summer jobs in the Defense Department for young men and women as part of the President's Youth Opportunity Campaign.

In a memorandum to all Military Departments and DOD agencies, Secretary McNamara directed that the new summer jobs, for young people between the ages of 16 and 21, be established at a ratio of at least one extra trainee for each 100 employees currently on the DOD payroll. The new jobs will be in addition to regular summer employment. Under this formula, approximately 10,000 new summer jobs would be created in DOD.

These new job opportunities for youth are to provide meaningful summer work and training opportunities. They may consist of any of the positions for which young men and women customarily are hired during the summer and such other work and training opportunities as can be made available.

Young people hired under the program will be paid $1.25 an hour, except in those instances when they are employed in positions for which a higher wage is appropriate under regular classification processes.

In the 1965 summer program, more than 14,000 young men and women or 40 percent above the 1-100 ratio, were usefully employed by DOD. In his memorandum Secretary McNamara pointed out last summer's highly successful effort and added, "I expect all components of the Department of Defense to do at least as well this summer."

National Security Seminars Schedule Announced

The Industrial College of the Armed Forces (ICAF) has announced the dates and locations for National Security Seminars to be presented during the academic year 1966-67. These two week sessions are open to reserve officers of all the Military Services and representatives of industry, labor, business, the professions, religion and education.

Each seminar is based on the 10-month resident course conducted by ICAF, and consists of a series of 34 illustrated presentations on topics and problems having a direct bearing on national security.

Senior officers from the faculty of ICAF, representing the Army, Navy, Air Force and Marine Corps, will conduct the seminars.

The schedule has been set as follows:

Sept. 26-Oct. 7, 1966	Baton Rouge, La.
Nov. 7-18, 1966	Quad-City Area (Moline, East Moline, Rock Island, Ill., and Davenport, Iowa.)
Jan. 16-27, 1967	Gainesville, Fla.
Feb. 13-24, 1967	Yakima, Wash.
March 6-17, 1967	Long Beach, Calif.
April 17-28, 1967	Wichita Falls, Tex.
May 15-26, 1967	Groton, Conn.

For information concerning registration and attendance, contact the Chamber of Commerce in any of the selected cities.

DEFENSE INDUSTR[illegible]
BULLETI[illegible]

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The Defense Industry Bullet[illegible] is published monthly by the Busin[illegible] & Labor Division, Directorate [illegible] Community Relations, Office of [illegible] Assistant Secretary of Defense (P[illegible] lic Affairs). [illegible] for printi[illegible] this publication was approved by [illegible] Director of the Bureau of the Budg[illegible]

The purpose of the Bulletin [illegible] communicati[illegible] between the Department of Defen[illegible] (DOD) and its authorized agen[illegible] and defense contractors and oth[illegible] business interests. It will serve [illegible] a guide to industry concerning [illegible] policies, programs and proje[illegible] and will seek to stimulate thought [illegible] members of the defense industry te[illegible] in solving the problems that may a[illegible] in fulfilling the requirements of [illegible]

Material in the Bulletin is [illegible] to supply pertinent unclassifi[illegible] data of interest to the business co[illegible] munity. Suggestions from indust[illegible] representatives for topics to be c[illegible] in future issues should be f[illegible] to the Business & Lab[illegible] Division.

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Address by Secretary of Defense Robert S. McNamara Before American Society of Newspaper Editors Wednesday, May 18, 1966, Montreal, Canada

Any American would be fortunate to visit this lovely island city, in this hospitable land.

But there is a special satisfaction for a Secretary of Defense to cross the longest border in the world—and realize that it is also the least armed border in the world. It prompts one to reflect how negative and narrow a notion of defense still clouds our century.

There is still among us an almost eradicable tendency to think of our security problem as being exclusively a military problem—and to think of the military problem as being exclusively a weapon system or hardware problem.

The plain, blunt truth is that contemporary man still conceives of war and peace in much the same stereotyped terms that his ancestors did. The fact that these ancestors—both recent and remote—were conspicuously unsuccessful at avoiding war, and enlarging peace, doesn't seem to dampen our capacity for cliches.

We still tend to conceive of national security almost solely as a state of armed readiness; a vast, awesome arsenal of weaponry.

We still tend to assume that it is primarily this purely military ingredient that creates security.

We are still haunted by this concept of military hardware. But how limited a concept this actually is, becomes apparent when one ponders the kind of peace that exists between the United States and Canada.

It is a very cogent example. Here we are, two modern nations, highly developed technologically, each with immense territory, both enriched with great reserves of natural resources, each militarily sophisticated. Yet, we sit across from one another, divided by an unguarded frontier of thousands of miles, and there is not a remotest set of circumstances, in any imaginable time frame of the future, in which our two nations would wage war on one another.

It is so unthinkable an idea as to be totally absurd.

But why is that so?

Is it because we are both ready in an instant to hurl our military hardware at one another?

Is it because we are both zeroed in on one another's vital targets?

Is it because we are both armed to our technological teeth that we do not go to war?

The whole notion—as applied to our two countries—is ludicrous.

Canada and the United States are at peace for reasons that have nothing whatever to do with our mutual military readiness.

We are at peace—truly at peace—because of the vast fund of compatible beliefs, common principles and shared ideals.

We have our differences and our diversity—and let us hope for the sake of a mutually rewarding relationship we never become sterile carbon copies of one another.

But the whole point is that our basis of mutual peace has nothing whatever to do with our military hardware.

Now this is not to say, obviously enough, that the concept of military deterrence is no longer relevant in the contemporary world.

Unhappily, it still is critically relevant with respect to our potential adversaries.

But it has no relevance whatever between the United States and Canada.

We are not adversaries. We are not going to become adversaries. And it is not mutual military deterrence that keeps us from becoming adversaries. It is mutual respect for common principles.

Now I mention this—as obvious as it all is—simply as a kind of *reductio ad absurdum* of the concept that military hardware is the exclusive or even the primary ingredient of permanent peace in the mid-twentieth century.

In the United States over the past five years we have achieved a considerably improved balance in our total military posture. That was the mandate I received from Presidents Kennedy and Johnson; and with their support, and that of the Congress, we have been able to create a strengthened force structure of land, sea and air components—with a vast increase in mobility and materiel and with a massive superiority in nuclear retaliatory power over any combination of potential adversaries.

Our capabilities for nuclear, conventional and counter-subversive war have all been broadened and improved; and we have accomplished this through military budgets that were in fact lesser percentages of our gross national product than in the past.

From the point of view of combat readiness, the United States has never been militarily stronger.

We intend to maintain that readiness.

But if we think profoundly about the matter, it is clear that this purely military posture is not the central element in our security.

A nation can reach the point at which it does not buy more security for itself simply by buying more military hardware—we are at that point.

The decisive factor for a powerful nation—already adequately armed—is the character of its relationships with the world.

In this respect, there are three broad groups of nations: first, those that are struggling to develop; secondly, those free nations that have reached a level of strength and prosperity that enables them to contribute to the peace of the world; and, finally, those nations who might be tempted to make themselves our adversaries.

For each of these groups, the United States, to preserve its own intrinsic security, has to have distinctive sets of relationships.

First, we have to help protect those developing countries which genuinely need and request our help, and which—as an essential pre-condition—are willing and able to help themselves.

Second, we have to encourage and achieve a more effective partnership with those nations who can and should share international peace-keeping responsibilities.

Third, we must do all we realistically can to reduce the risk of conflict with those who might be tempted to take up arms against us.

Let us examine these three sets of relationships in detail.

First, the developing nations.

Roughly 100 countries today are caught up in the difficult transition from traditional to modern societies.

There is no uniform rate of progress among them, and they range from

primitive mosaic societies—fractured by tribalism and held feebly together by the slenderest of political sinews—to relatively sophisticated countries, well on the road to agricultural sufficiency and industrial competence.

This sweeping surge of development, particularly across the whole southern half of the globe, has no parallel in history.

It has turned traditionally listless areas of the world into seething cauldrons of change.

On the whole, it has not been a very peaceful process.

In the last eight years alone there have been no less than 164 internationally significant outbreaks of violence — each of them specifically designed as a serious challenge to the authority, or the very existence, of the government in question.

Eighty-two different governments have been directly involved.

What is striking is that only 15 of these 164 significant resorts to violence have been military conflicts between two states.

And not a single one of the 164 conflicts has been a formally declared war.

Indeed, there has not been a formal declaration of war—anywhere in the world—since World War II.

The planet is becoming a dangerous place to live on not merely because of a potential nuclear holocaust, but also because of the large number of *de facto* conflicts and because the trend of such conflicts is growing rather than diminishing.

At the beginning of 1958, there were 23 prolonged insurgencies going on about the world. As of Feb. 1, 1966, there were 40.

Further, the total number of outbreaks of violence has increased each year: in 1958, there were 34; in 1965, there were 58.

But what is most significant of all is that there is a direct and constant relationship between the incidence of violence and the economic status of the countries afflicted.

The World Bank divides nations, on the basis of per capita income, into four categories: rich, middle-income, poor, and very poor.

The rich nations are those with a per capita income of $750 per year or more. The current U.S. level is more than $2,700. There are 27 of these rich nations. They possess 75 percent of the world's wealth, though roughly only 25 percent of the world's population.

Since 1958, only one of these 27 nations has suffered a major internal upheaval on its own territory.

But observe what happens at the other end of the economic scale. Among the 38 very poor nations—those with a per capita income of under $100 a year—no less than 32 have suffered significant conflicts. Indeed, they have suffered an average of two major outbreaks of violence per country in the eight-year period. That is a great deal of conflict.

What is worse, it has been, predominantly, conflict of a prolonged nature.

The trend holds predictably constant in the case of the two other categories: the poor, and the middle-income nations. Since 1958, 87 percent of the very poor nations, 69 percent of the poor nations, and 48 percent of the middle-income nations have suffered serious violence.

There can, then, be no question but that there is an irrefutable relationship between violence and economic backwardness. And the trend of such violence is up, not down.

Now, it would perhaps be somewhat reassuring if the gap between the rich nations and the poor nations were closing; and economic backwardness were significantly receding.

But it is not. The economic gap is widening.

By the year 1970, over one half of the world's total population will live in the independent nations sweeping across the southern half of the planet. But this hungering half of the human race will by then command only one-sixth of the world's total of goods and services.

By the year 1975, the dependent children of these nations alone—children under 15 years of age—will equal the total population of the developed nations to the north.

Even in our own abundant societies, we have reason enough to worry over the tensions that coil and tighten among underprivileged young people, and finally flail out in delinquency and crime. What are we to expect from a whole hemisphere of youth where mounting frustrations are likely to fester into eruptions of violence and extremism?

Annual per capita income in roughly half of the 80 underdeveloped nations that are members of the World Bank is rising by a paltry one percent a year or less. By the end of the century, these nations—at their present rates of growth—will reach a per capita income of barely $170 a year. The United States, by the same criteria, will attain a per capita income of $4,500.

The conclusion of all this is blunt and inescapable: given the certain connection between economic stagnation and the incidence of violence, the years that lie ahead for the nations in the southern half of the globe are pregnant with violence.

This would be true even if no threat of communist subversion existed—as it clearly does.

Both Moscow and Peking—however harsh their internal differences—regard the whole modernization process as an ideal environment for the growth of communism. Their experience with subversive internal war is extensive and they have developed a considerable array of both doctrine and practical measures in the art of political violence.

What is often misunderstood is that communists are capable of subverting, manipulating and, finally, directing for their own ends the wholly legitimate grievances of a developing society.

But it would be a gross oversimplification to regard communism as the central factor in every conflict throughout the underdeveloped world. Of the 149 serious internal insurgencies in the past eight years, communists have been involved in only 58 of them—38 percent of the total—and this includes seven instances in which a communist regime itself was the target of the uprising.

Whether communists are involved or not, violence anywhere in a taut world transmits sharp signals through the complex ganglia of international relations; and the security of the United States is related to the security and stability of nations half a globe away.

But neither conscience nor sanity itself suggests that the United States is, should, or could be the Global Gendarme.

Quite the contrary, experience confirms what human nature suggests: that in most instances of internal violence the local people themselves are best able to deal directly with the situation within the framework of their own traditions.

The United States has no mandate from on high to police the world, and no inclination to do so. There have been classic cases in which our deliberate non-action was the wisest action of all.

Where our help is not sought, it is seldom prudent to volunteer.

Certainly we have no charter to rescue floundering regimes, who have brought violence on themselves by deliberately refusing to meet the legitimate expectations of their citizenry.

Further, throughout the next decade advancing technology will reduce the requirement for bases and staging rights at particular locations abroad, and the whole pattern of forward deployment will gradually change.

But—though all these caveats are clear enough—the irreducible fact re-

mains that our security is related directly to the security of the newly developing world.

And our role must be precisely this: to help provide security to those developing nations which genuinely need and request our help, and which demonstrably are willing and able to help themselves.

The rub comes in this: we do not always grasp the meaning of the word security in this context.

In a modernizing society security means development.

Security is not military hardware, though it may include it. Security is not military force, though it may involve it. Security is not traditional military activity, though it may encompass it.

Security is development.

Without development, there can be no security.

A developing nation that does not in fact develop simply cannot remain "secure."

It cannot remain secure for the intractable reason that its own citizenry cannot shed its human nature.

If security implies anything, it implies a minimal measure of order and stability.

Without internal development of at least a minimal degree, order and stability are simply not possible. They are not possible because human nature cannot be frustrated beyond intrinsic limits. It reacts because it must.

Now, that is what we do not always understand; and that is also what governments of modernizing nations do not always understand.

But by emphasizing that security arises from development, I do not say that an underdeveloped nation cannot be subverted from within, or be aggressed upon from without, or be the victim of a combination of the two.

It can. And to prevent any or all of these conditions, a nation does require appropriate military capabilities to deal with the specific problem. But the specific military problem is only a narrow facet of the broader security problem.

Military force can help provide law and order, but only to the degree that a basis for law and order already exists in the developing society—a basic willingness on the part of the people to cooperate.

The law and order is a shield, behind which the central fact of security—development—can be achieved.

Now we are not playing a semantic game with these words.

The trouble is that we have been lost in a semantic jungle for too long. We have come to identify "security" with exclusively military phenomena, and most particularly with military hardware.

But it just isn't so. And we need to accommodate to the facts of the matter if we want to see security survive and grow in the southern half of the globe.

Development means economic, social and political progress. It means a reasonable standard of living — and the word "reasonable" in this context requires continual redefinition. What is reasonable in an earlier stage of development will become unreasonable in a later stage.

As development progresses, security progresses; and when the people of a nation have organized their own human and natural resources to provide themselves with what they need and expect out of life, and have learned to compromise peacefully among competing demands in the larger national interest, then their resistance to disorder and violence will be enormously increased.

Conversely, the tragic need of desperate men to resort to force to achieve the inner imperatives of human decency will diminish.

Now, I have said that the role of the United States is to help provide security to those modernizing nations, providing they need and request our help and are clearly willing and able to help themselves.

But what should our help be?

Clearly, it should be help towards development. In the military sphere, that involves two broad categories of assistance.

We should help the developing nation with such training and equipment as is necessary to maintain the protective shield behind which development can go forward.

The dimensions of that shield vary from country to country; but what is essential is that it should be a shield and not a capacity for external aggression.

The second—and perhaps less understood category of military assistance in a modernizing nation — is training in civic action.

Civic action is another one of those semantic puzzles. Too few Americans — and too few officials in developing nations—really comprehend what military civic action means.

Essentially, it means using indigenous military forces for non-traditional military projects — projects that are useful to the local population in fields such as education, public works, health, sanitation, agriculture—indeed, anything connected with economic or social progress.

It has had some impressive results. In the past four years, the U.S.-assisted civic action program, worldwide, has constructed or repaired more than 10,000 miles of roads; built over 1,000 schools, hundreds of hospitals and clinics; and has provided medical and dental care to approximately four million people.

What is important is that all this was done by indigenous men in uniform. Quite apart from the developmental projects themselves, the program powerfully alters the negative image of the military man as the oppressive preserver of the stagnant *status quo*.

But assistance in the purely military sphere is not enough. Economic assistance is also essential. The President is determined that our aid should be hard headed and rigorously realistic: that it should deal directly with the roots of under-development, and not merely attempt to alleviate the symptoms. His bedrock principle is that U.S. economic aid — no matter what its magnitude—is futile unless the country in question is resolute in making the primary effort itself. That will be the criterion, and that will be the crucial condition for all our future assistance.

Only the developing nations themselves can take the fundamental measures that make outside assistance meaningful. These measures are often unpalatable and frequently call for political courage and decisiveness. But to fail to undertake painful, but essential reform inevitably leads to far more painful revolutionary violence. Our economic assistance is designed to offer a reasonable alternative to that violence. It is designed to help substitute peaceful progress for tragic internal conflict.

The United States intends to be compassionate and generous in this effort, but it is not an effort it can carry exclusively by itself. And, thus, it looks to those nations who have reached the point of self-sustaining prosperity to increase their contribution to the development—and, thus, to the security—of the modernizing world.

And that brings me to the second set of relationships that I underscored at the outset: it is the policy of the United States to encourage and achieve a more effective partnership with those nations who can, and should, share international peacekeeping responsibilities.

America has devoted a higher proportion of its gross national product to its military establishment than any other major free world nation. This was even true before our increased expenditures in Southeast Asia.

We have had, over the last few years, as many men in uniform as all the nations of Western Europe combined, even though they have a pop-

ulation half again greater than our own.

Now, the American people are not going to shirk their obligations in any part of the world, but they clearly cannot be expected to bear a disproportionate share of the common burden indefinitely.

If, for example, other nations genuinely believe—as they say they do—that it is in the common interest to deter the expansion of Red China's economic and political control beyond its natural boundaries, then they must take a more active role in guarding the defense perimeter.

Let me be perfectly clear: this is not to question the policy of neutralism or non-alignment of any particular nation. But it is to emphasize that the independence of such nations can—in the end—be fully safeguarded only by collective agreements among themselves and their neighbors.

The plain truth is the day is coming when no single nation, however powerful, can undertake by itself to keep the peace outside its own borders. Regional and international organizations for peace-keeping purposes are as yet rudimentary; but they must grow in experience and be strengthened by deliberate and practical cooperative action.

In this matter, the example of Canada is a model for nations everywhere. As Prime Minister Pearson pointed out eloquently in New York just last week: Canada "is as deeply involved in the world's affairs as any country of its size. We accept this because we have learned over 50 years that isolation from the policies that determine war does not give us immunity from the bloody, sacrificial consequences of their failure. We learned that in 1914 and again in 1939. That is why we have been proud to send our men to take part in every peace-keeping operation of the United Nations—in Korea, and Kashmir, and the Suez, and the Congo, and Cyprus."

The Organization of the American States in the Dominican Republic, the more than 30 nations contributing troops or supplies to assist the government of South Vietnam, indeed even the parallel efforts of the United States and the Soviet Union in the Pakistan-India conflict—these efforts, together with those of the United Nations, are the first attempts to substitute multinational for unilateral policing of violence. They point to the peace-keeping patterns of the future.

We must not merely applaud the idea. We must dedicate talent, resources and hard practical thinking to its implementation.

In Western Europe—an area whose burgeoning economic vitality stands as a monument to the wisdom of the Marshall Plan — the problems of security are neither static nor wholly new. Fundamental changes are under way, though certain inescapable realities remain.

The conventional forces of NATO, for example, still require a nuclear backdrop beyond the capability of any Western European nation to supply, and the United States is fully committed to provide that major nuclear deterrent.

However, the European members of the alliance have a natural desire to participate more actively in nuclear planning. A central task of the alliance today is, therefore, to work out the relationships and institutions through which shared nuclear planning can be effective. We have made a practical and promising start in the Special Committee of NATO Defense Ministers.

Common planning and consultation are essential aspects of any sensible substitute to the unworkable and dangerous alternative of independent national nuclear forces within the alliance.

And even beyond the alliance, we must find the means to prevent the proliferation of nuclear weapons. That is a clear imperative.

There are, of course, risks in nonproliferation arrangements, but they cannot be compared with the infinitely greater risks that would arise out of the increase in national nuclear stockpiles.

In the calculus of risk, to proliferate independent national nuclear forces is not a mere arithmetical addition of danger. We would not be merely adding up risks. We would be insanely multiplying them.

If we seriously intend to pass on a world to our children that is not threatened by nuclear holocaust, we must come to grips with the problem of proliferation.

A reasonable nonproliferation agreement is feasible. For there is no adversary with whom we do not share a common interest in avoiding mutual destruction triggered by an irresponsible nth power.

That brings me to the third and last set of relationships the United States must deal with: those with nations who might be tempted to take up arms against us.

These relationships call for realism. But realism is not a hardened, inflexible, unimaginative attitude. The realistic mind is a restlessly creative mind free of naive delusions, but full of practical alternatives.

There are practical alternatives to our current relationships with both the Soviet Union and Communist China.

A vast ideological chasm separates us from them—and to a degree, separates them from one another.

There is nothing to be gained from our seeking an ideological rapprochement; but breaching the isolation of great nations like Red China, even when that isolation is largely of its own making, reduces the danger of potential catastrophic misunderstandings, and increases the incentive on both sides to resolve disputes by reason other than force.

There are many ways in which we can build bridges toward nations who would cut themselves off from the meaningful contact with us. We can do so with properly balanced trade relations, diplomatic contacts and, in some cases, even by exchanges of military observers.

We have to know where it is we want to place this bridge, what sort of traffic we want to travel over it, and on what mutual foundations the whole structure can be designed.

There are no one-cliff bridges. If you are going to span a chasm, you have to rest the structure on both cliffs.

Now cliffs, generally speaking, are rather hazardous places. Some people are afraid even to look over the edge. But in a thermonuclear world, we cannot afford any political acrophobia.

President Johnson has put the matter squarely. By building bridges to those who make themselves our adversaries "we can help gradually to create a community of interest, a community of effort."

With respect to a "community of effort," let me suggest a concrete proposal for our own present young generation in the United States.

It is a committed and dedicated generation. It has proven that in its enormously impressive performance in the Peace Corps overseas; and in its willingness to volunteer for a final assault on such poverty and lack of opportunity that still remain in our own country.

As matters stand, our present Selective Service System draws on only a minority of eligible young men.

That is an inequity.

It seems to me that we could move toward remedying that inequity by asking every young person in the United States to give two years of service to his country—whether in one of the Military Services, in the Peace Corps, or in some other volunteer developmental work at home or abroad.

We could encourage other countries to do the same; and we could work out exchange programs much as the Peace Corps is already planning to do.

While this is not an altogether new suggestion, it has been criticized as

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Ideas and Know-How Key to Small Business Success

A familiar cliche that has been kicking around the business world for too many years holds that only large companies are capable of competing successfully for Department of Defense contracts. Until recently, the feeling was that only a huge concern with a lot of sophisticated equipment backed up by years of experience could satisfy the needs of the military, particularly in the area of new systems and weapons.

However, the idea that small companies don't stand a chance against larger corporations is becoming more obsolete every year. Some of the largest DOD contractors today began not long ago as small business suppliers. Such well known corporations as Litton Industries, Sanders Associates and Teledyne all started as small concerns and expanded because of their competent work on DOD projects.

A small company with a good idea and a lot of technical knowledge always has a good chance of competing in the same league as the "big boys." This is possible because DOD recognizes that creative thinking based on sound technical background is valuable whether it originates in large or small organizations.

An example of a small company success is the case history of the Stencel Aero Engineering Corp. of Asheville, N.C.

The ability of this company's managers to understand and provide hardware solutions for specific military problems has been the driving force responsible for the organization's growth from a three-man operation in 1958 into a corporation that grossed nearly a million dollars last year.

The founder of this remarkable company is Fred B. Stencel, a native of Yugoslavia born in 1909. After acquiring an impressive technical background abroad, including post-graduate work in aero-elasticity, aerodynamics and hydrodynamics, Stencel came to the United States in 1916 and went to work for the U.S. Army.

A few years later, after serving for a short time with a private arms industry, Stencel decided to branch out on his own and develop an idea which had come to him during his experience in working with parachute development for the Army.

One of his accomplishments while working with the Oerlikon Tool and Arms Corp. was the invention of the first practicable and repeatable parachute capable of functioning in a wide range of aerodynamic conditions. This concept became the cornerstone of what was later to be his own company.

Setting up shop in an abandoned barn near Asheville, N.C., Stencel and two comrades began to develop the idea. The trio's first success came when the Air Force awarded them a contract for further development of ballistically deployed and ballistically spread parachutes to provide escape from slow-moving planes operating at low altitudes.

After successfully completing this assignment, the company was picked to develop a 100-foot diameter parachute which would provide a safety system for high-altitude manned balloons. Stencel's growing company was contracted to design and deliver a recovery system for the U.S. Navy's Strato-Lab Project in eight weeks. Stencel and his assistants met the deadline and produced a parachute system which would achieve full recovery within a drop distance of 100 feet compared to 1,000 to 1,500 feet which was the limit of conventional parachutes at that time.

Much of the work done on the Navy project, including construction of two 100-foot testing towers, was done under extremely adverse conditions resulting from the aftermath of a disastrous hurricane that had lashed Asheville a few days earlier.

This tenacity to succeed in assignments was recognized and led to other small Government prime and sub-contracts which aided in the growth of the young company.

In 1960, the Navy's Bureau of Weapons awarded Stencel Aero Engineering Corp. a contract to develop a ballistic parachute system for use with ejection seats and, in 1961, after heavy competition, the company was chosen to develop a new concept for emergency escape and survival from aircraft.

The result of all this labor was the MODULAR system (Modular Restraint, Recovery and Survival System) which combined the various separate escape system components already developed thus increasing overall escape and survival capabilities.

This work led to Stencel's interest in other escape system problems. One question which had been bothering aircraft engineers was how to deal with the angular momentum of the man-seat combination of the ejection escape system which occurred because the center of gravity varies from man to man.

Working on this problem on his own time and using his own funds, Stencel came up with the answer. The result was the DART system, a major contribution in aerospace engineering now universally recognized as a requirement for rocket escape systems.

The company is now busy on an escape system called MODPAC. This system will combine the development work done on the ballistic parachute, the MODULAR system and the DART system. Stencel expects that the system will be ready for production and installation into military aircraft by June this year.

A gauge of the company's phenomenal growth, which has been based completely on DOD prime and subcontracts, can be seen in a comparison of the net sales which, in 1959, totaled $79,657 and in 1965 were just short of a million dollars.

One of the main reasons for the success of the Stencel Aero Engineering Corp. is the company's ability to devise simple and practical hardware solutions to complex problems and the ability to bring together in one organization creative people with diverse technical backgrounds and form these people into an efficient team which has maintained a continued high standard of performance.

(Continued on Page 12)

Military Exports and World Affairs

by
Henry J. Kuss, Jr.
Dep. Asst. Secretary of Defense
(International Logistics Negotiations)

Many in the industrial community must already be aware of the linkage between military exports and world affairs. In this article I would like to cover this relationship in three ways:

- To identify this linkage in quantitative or proportional terms.
- To describe the military-political-economic linkage to these exports in some of the significant negotiations of the recent past.
- Finally in greater detail, to examine some of the world forces that are set in movement by this export program as they apply specifically to Europe and as they are manifested in the United Kingdom's consideration of its own industry.

First, let us take a brief look at the scope of military exports in recent years and the potential for the next few years. In FY 1965 military export orders rose to $1.82 billion for the highest amount since the beginning of the program in the 1961–1962 period. This represented a 600 percent increase over the annual experience most representative of the 1950's.

Over $7 billion in potential has been identified for the period 1966–1968 or an overage of almost $2.5 billion per year.

We expect military export orders to continue at a minimum of $1 to $1.5 billion a year as long as it is necessary for the free world to maintain adequate defense employment, spread through all 50 states and the District of Columbia, will result from this effort.

Almost $1 billion in additional profits will accrue to U. S. industry.

Case receipts amounted to almost $5 billion for the last five years.

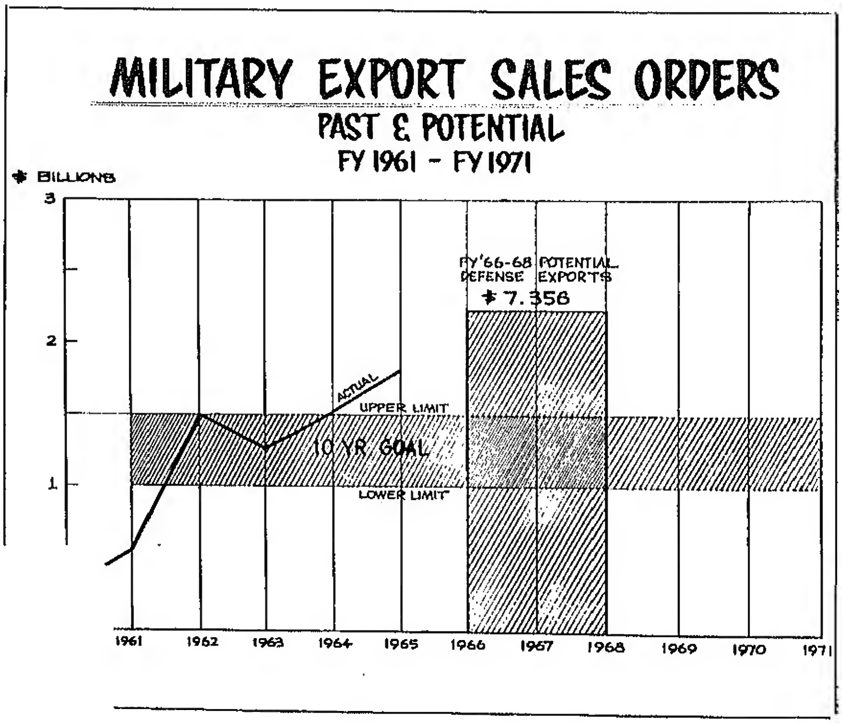
Linkage in Quantitative or Proportional Terms.

Turning now to the relationship of military exports and world affairs in quantitative or proportional terms, let me ask you to ponder the anomalies inherent in these questions:

- Are you aware that while military exports constitute less than five percent of the total defense business in the United States, they constitute a much more significant proportion of the balance of the free world's defense business, running 15 to 25 percent average and sometimes 50 to 75 percent of individual area or country defense expenditures?
- Are you aware that, while military exports constitute less than four percent of our annual expenditures to develop U. S. forces, they account for almost half of the deployment costs of those forces as measured against our balance of payments?
- Are you aware that, while we have sold to about 60 nations in the recent past, less than 10 of these nations account for almost 90 percent of the sales?

Let's take a look at these three quantitative expressions and see how they affect world affairs. Starting with the last one—10 of the nations account for 90 percent of the sales—what this really means is that our major sales are to those countries who have the largest and most ready forces who make up the bulk of allied military readiness. In order of their significance in the sales program, they are:

- German forces, who have bought over $3 billion from us in the last four years and who will in time of war actually make up, together with our five divisions in Europe, one of the major field armies defending NATO.
- The United Kingdom which, with the signing of the F-111 program, is expected to spend over $2 billion in the United States for military arms in future years and which constitutes the principal European



nation maintaining, with the United States, world-wide responsibility for the maintenance of peace—from Germany to the Atlantic Ocean to Libya to the Indian Ocean to Malaysia.

- Australia, a nation coming alive to the problem of preparedness in Southeast Asia and the need to provide for its defense, a nation which has or will purchase $.53 billion of military products from the United States.

- Italy, Canada, Belgium and other NATO nations which constitute a major link in our world-wide forward strategy, buying almost another billion dollars of products to strengthen their defenses.

- Japan, awakening to its self-defense responsibilities, in the context of a growing national product, is closely aligned with the free world.

Let's look at the facts brought out by the second question: while military exports are four percent of our total annual defense budget, they account for more than half of the deployment costs of our forces, measured in balance of payments terms. Here we are not talking about allied strength, but are talking about our ability to project our strength around the world. The ability of this country to follow a forward strategy is heavily influenced by the balance of payments costs attributable to such a strategy. If we were unable to maintain adequate military deployment, we might be unable to seize political opportunities, or we might not be able to follow a strategy of defending the United States at the frontiers of the non-communist world, or we might have to seek these objectives with higher risks. The receipts from military exports are of interest to the nation because of their major contribution to offsetting the foreign exchange deployment costs of our strategy.

Turning to the first point—while military exports constitute less than five percent of the total funds spent for the acquisition and development of military production in the United States, they constitute 15 to 25 percent average and sometimes 50 to 75 percent of individual country defense expenditures. No other figure magnifies the relationship of military exports to world affairs as compared with domestic affairs. While a sale may constitute three percent or less of our total or an individual company's business, it is almost always 25 percent or more of the foreign country's defense program. This means that, while the military export transaction may be very peripheral to a company's business life, it is decidedly anything but peripheral at the other end of the pipeline. Sometimes this difference in perspective between the supplier and the customer leads to complications contrary to our national interests.

Thus, you can see that the impact of our military exports, although large in itself for domestic consideration, is multiplied manyfold when viewed from a world affairs point of view:

- From considerations of military strength of countries allied to us.

- From the point of view of our own economic health in the world and ability to deploy for a forward strategy.

- From the point of view of the impact on the customer country's political and economic environments.

Military-Political-Economic Linkage.

I should like to turn now to a non-quantitative look at some of our principal military export areas of effort and see how these relate to world affairs.

First, as I have already mentioned with respect to Germany, our program is part of a very carefully worked out set of international activities between the German Armed Forces and the American Armed Forces. These activities are of benefit to the equipment, logistics and training readiness of the German Armed Forces, as well as being of benefit to both nations in making it economically feasible for the United States to deploy a large force in the forward area. It is a program that manifests itself in carefully planned meetings of military and civilian staffs at all levels of government—integrated lines of logistics communication—integrated lines of voice and digital communications throughout our entire depot supply system—cooperation in research and development—joint use of training facilities and depots wherever possible—joint development of weapons like the Main Battle Tank of 1970—and even the gripping problems like metric versus inch system.

In the United Kingdom, contrary to popular belief, the military export program never was a sales program. It was a program worked out in direct response to the United Kingdom's needs to put forth a defense establishment within an economic belt tightening program. The three recent aircraft programs were part of an action to save well over $1 billion in the British defense budget. Without this action the British Armed Forces would have been considerably more restricted in manifesting a British defense responsibility throughout the world. This was a program that represented our national interest in world affairs as well. Its solution in the context of international politics required the closest association between government and industry action. The action of McDonnell, General Dynamics and Lockheed working with the U. S. Government on this program of international cooperation has been excellent.

In Australia our military export program was first a manifestation of close U. S.-Australian military-to-military interests. Secondly, it was a result of the growing Australian recognition of the severity of the Southeast Asian problem and, thirdly, a cooperation in the broadest field of international finance—before it ever became a sales program.

Our program in Canada was and is a demonstration of the reciprocity required between two nations whose economies are so closely linked. Without such recognition the Canadian Armed Forces could not gain the benefits of the Canadian-American defense common market.

Our programs in India and Iran were negotiated in such a way that they were as much a recognition of the need for military strength against the communist bloc as they were a recognition of the need to maintain the expenditure of resources on military activity within certain reasonable financial levels—levels that did not interfere with the economic and social progress of each country's program.

Similarly, our examination of the future aviation products in Latin America involves as much a question of the relationship to the entire success of the Alliance for Progress as it does individual military sales.

In the Middle East our actions are as much a part of attempting to

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Navy Authorized Data List--
A Management Technique

by
A. N. Bayer

Added to a progressive series of Navy planned actions in the area of improved management of technical logistics data and information is the promulgation of the "Navy Authorized Data List (NADL)." The NADL —a management technique—is designed to identify, record and control every significant technical data requirement for which there exists a legitimate need in the Navy.

The issuance of the Authorized Data List as a limited coordination Military Handbook, MIL-HDBK-222 (Navy), provides a "master" reference list from which Navy procuring activities are able to select and specify data requirements for bids and proposals. Approved data items are included in DD Form 1423, "Contractor Data Requirement List." Such specificity provides a basis for a full, clear and firm understanding between the Navy and its contractors with respect to the total data requirements at the time the contract is placed.

What types and kinds of data are referenced in the NADL? It includes specifications, standards, engineering drawings, associated lists, data lists, bills of material, parts lists, technical manuals, handbooks and orders, engineering changes and control documents, design data, provisioning parts lists and related initial support data, reliability, maintainability and other systems effectiveness documents, acceptance test procedures, PERT time, cost and management information, personnel and human factors data, and reports (including scientific and technical reports). It includes without limitation those varieties of technical data (whether applicable to research, engineering, logistics, or other functions) derived at any phase of development parent documents, particularly specifications.

In compliance with the objectives of the DOD Standardization Program and the Armed Services Procurement Regulation (ASPR), Section 1, Part 12, "Specifications, Plans and Drawings," the Navy has prepared many specifications for use in design and procurement of systems, end items, primary equipment, items, materials and services. In many instances, specifications (as accurate and complete descriptions of the technical requirements) include specific data requirements in order that both the contractor and the Government may readily determine that the total requirements have been met. The specification represents an established system featuring a common language which permits, encourages and facilitates communication between the Military Services and industry. Established and well documented procedures exist for the coordination of specifications, and all data requirements in coordinated specifications represent joint Service agreements with generous industry input. Deviations to specifications are subjected to a degree of control which may not be available in the case of unilateral decisions on deviations to separate data item sheets or forms.

Further, specifications are widely recognized and used throughout industry. They are recorded in the DOD Index of Specifications and Standards (DODISS) and are readily available from the DOD Single Stock Point. Accordingly, the concept and content of the NADL requires that a positive relationship be established to "data call-outs in specifications" (wherein the data requirements are related to the hardware procurement or the task to be performed). The Navy intends to develop a fully prepared Form DD 1423 for most of its primary equipment or end item specifications.

How can control be maintained over the generation of data requirements in parent documents? The Navy's approach was elementary in regard to the tedious manual methods employed during the review of source documents. Yet, the approach was unique in that decisions over approved data items and the document sources of such items were recorded and programed for publication purposes by the use of automatic data processing methods. Some 40,000 documents (including all Navy and other DOD coordinated specifications in the DOD Index of Specifications and Standards) were manually reviewed, page by page, paragraph by paragraph, in screening for data items. These 40,000 documents, if stacked vertically, would be some 35 feet in height. Every data item referenced in a document was identified and then cataloged by means of electric accounting punched card methods.

Non-approved data items were "scrubbed down and out." Approved data items were recorded as to the recognized identification number of the basic source document and to its applicable location (paragraph number) in the document. Further identification was made to the cognizant Navy material bureau technical code having primary responsibility over the data item. By this latter identification, continued engineering support is ensured by the "hardware" or "product" engineers who are called upon to determine applicable data items in fulfilling the DD 1423 requirements. As Navy source docu-

ments are initiated or revised in the future, intra-departmental procedures have been established to maintain mechanized control over the data items.

For complete flexibility and optimum usage, the NADL is prepared by automatic data processing methods and is arranged in four parts to permit entry and data selection on the basis of:

- An "Alphabetical" Listing of Primary (Hardware or Work Tasks) Documents arranged by the actual title (name) of the hardware or work task.
- A "Numerical" Listing of Primary (Hardware or Work Tasks) Documents arranged by the number of the applicable source material.
- A "Functional Category" Listing of all data items grouped to serve a specific function (e.g., design data, configuration control, reliability, logistics).
- An "Alphabetical" Listing of all data items which are included in basic source documents.

The NADL contains some 1,800 different data items. A specific data item, however, may have multi-application and use with several different types of hardware specifications. As a result, some 7,000 gross data item references have been recorded together with their referenced application to some 2,600 source documents (e.g., specifications, contract requirements bulletins). The NADL approaches a true minimum-maximum data list far broader in scope and coverage than that of 400-500 generalized data forms which the Navy originally intended to adopt. An old adage is "the proof of the pudding lies in the eating." Extensive review of completed, contractually agreed upon DD 1423's reveals that over 86 percent of the specified data items are "approved" data items which are included in the NADL. Such a high percentage of approved data items would not have been achieved if generalized data forms had been adopted with no correlation to the basic source documents which require the data.

Compilation of the NADL basically involves the consolidation (and reduction) of many existing definitized data requirements. These data requirements in many instances are already tailored to specific naval warfare systems, subsystems, end items, equipment, or work tasks. Determinations of data items from the NADL are made by:

- Utilizing a data Provisioning Check List Concept.
- Giving careful consideration to the immediately planned and probable use of the actual weapon system, item, or service to which the data relates.
- Selecting data items on the basis of the intended use(s) of the data.
- Selecting data items only after analyzation of the various types of data contained in the data packages which are related to the acquisition phases in which they are required.

In what single document do Navy personnel obtain the necessary criteria and guidance to make the above data determinations? NAVMATINST 4000.15, Nov. 20, 1964, titled "Management of Technical Data and Information—A Policy Manual," incorporates into a single publication comprehensive statements of policy and procedures to govern the management of technical logistics data and information within the Department of the Navy. The instruction applies to the acquisition of technical data, whether procured from contractors or prepared within the Navy, and its management in research, engineering, technical requirements, maintenance, quality assurance (including inspection), procurement and all other functions of the Navy, directly or indirectly concerned with such data.

Does the Navy support the increased emphasis being placed upon technical data management by DOD? Indeed so. In fact, in 1960 the Navy conducted a departmental-wide review of the policies and procedures of the bureaus and field activities regarding the acquisition, control and use of Navy-procured drawings and technical data. Principal objectives of the review were (1) to determine the strengths, weaknesses and controversial areas concerning the administrative, legal, contractual, technical and operational aspects of technical data management and (2) to recommend specific corrective actions to eliminate discrepancies, reduce data procurement costs, insure optimum use of acquired technical data and increase competitive procurement through improved use of technical data packages.

As a direct result of the Navy review, SECNAV Instruction 4120.12, "Establishment of Requirements for Engineering Drawings, Associated Lists and Additional," was issued in December 1960. This instruction was not only comprehensive but it was also unique in that it was:

- First to establish department-wide uniform procedures for limiting data requirements to those necessary to satisfy the Navy's intended uses, and to describe specific data generally needed for competitive procurement as well as for eight other principal intended uses of data (e.g., design approval and evaluation, provisioning, maintenance).
- First to prescribe negotiating techniques and guides related to pricing of data.
- First to prescribe means of satisfying data needs by less costly methods of preparation by using industry drafting standards.
- First to prescribe procedures to assure maintenance of data on items subject to continued Navy use and supply support to depict accurately changes or revisions in the items to which the data relates.
- First to provide for the organization and functions of Data Review Boards which review the establishment of data requirements and the acquisition of data.

All of the above innovations, together with additional DOD and Navy cost effectiveness implementing principles in the area of technical data management, are carried over in NAVMATINST 4000.15.

Navy planning for the future provides for the support of optimum uniformity and standardization of technical data management techniques throughout DOD as proposed by the Office of Technical Data and Standardization Policy in the Office of the Assistant Secretary of Defense (Installations and Logistics). A joint task, under the chairmanship of that office, is the consideration of a DOD Authorized Data List (DADL). This task, incidentally, was proposed by the Navy. The concept of developing a DADL is based on the principle that there is considerable commonality of data items both intra and interdepartmental-wise. It should also be recognized, however, that a substantial number of uncommon data requirements exist both intra and interdepartmental-wise. The Navy, although recognizing the concept of standard generalized data

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U.S. Government-Newport News Shipbuilding Firm Sign Equal Employment Opportunity Agreement

by
Allan Reeves
Office of Civil Rights & Industrial Relations
Office of Asst. Secretary of Defense (Manpower)

As a result of concerted effort by several Federal Government agencies, a historic first was achieved in the agreement signed in April between the nation's largest shipbuilder and the Equal Employment Opportunity Commission.

The Newport News, Virginia, Shipbuilding & Drydock Co., became the first major company to sign a comprehensive agreement covering its responsibilities and obligations in the area of equal employment opportunity. The pattern, established during the six days of intensive negotiation in Washington, D.C., may well have a far-reaching effect, for the correction of discrimination, on other industries.

Secretary of Labor W. Willard Wirtz, whose Office of Federal Contract Compliance directs Government agency contracting officers in their equal employment opportunity programs, said, "The successful completion of these negotiations resulted from a concerted Government effort to make Equal Employment Opportunity a fact at this major shipbuilding firm."

The Newport News Shipbuilding and Drydock Co. builds nuclear submarines, aircraft carriers and other ships for the U. S. Government. Its contracts run into billions of dollars. The company presently employs about 20,000 persons, of whom about 5,000 are Negroes. Its last report to the Government showed that only 32 out of 1,997 persons employed in supervisory positions were Negroes. In addition, the report indicated that only six out of 506 apprentices enrolled were Negroes.

Based on this report, a determination was made by the Departments of Defense and Labor that Newport News was in noncompliance with the rules and regulations carrying out the provisions of Executive Order 11246 dealing with Federal contracts.

Concurrently, 41 Negro employees filed employment discrimination charges under Title VII of the Civil Rights Act of 1964. The Civil Rights Act of 1964, under Title VII, provides that relief from employment discrimination may be sought by injured parties.

As a result of these actions, Newport News began conciliation sessions in an attempt to work out an agreement that would prove acceptable to all parties concerned.

During the course of the meetings between the Government and Newport News, an order was issued by the Secretary of Labor directing all Federal agencies not to award contracts to Newport News until the agencies and the Department of Labor were satisfied that the company was in compliance with the Executive Order requiring equal employment opportunity. Upon completion of the agreement, the Labor Department's order was rescinded.

The remedial program, which the Government and the company developed, reflects a program of full scale dynamic affirmative action designed to counteract effects of prior discrimination.

Under the terms of the agreement, an outside expert, approved by the company and the Government, will evaluate jobs and pay rates in the Newport News plant to determine whether Negroes are being paid the same rates as whites doing substantially equivalent work. Where it is determined that Negroes are being paid discriminatory rates, they will be immediately raised to equivalent levels with white employees.

A team of DOD equal employment opportunity specialists will conduct a survey of key departments of the company to determine the promotion pattern of white employees over past years. The history of Negro promotions will be compared to the white promotion profile and, where Negroes have not progressed accordingly, they will be promoted immediately.

Provisions of the agreement provide for the immediate promotion of three Negroes, who had filed charges, to supervisory positions and rapid conciliation of the complaints of the other 38 charging parties. The agreement further provides for:

- Opening of all job classifications to all employees without discrimination.
- Complete elimination of segregated facilities.
- Revision of promotion policies and practices to improve opportunities for qualified Negroes to and within supervisory levels.
- Improvements of transfer procedure to other departments for Negroes.
- Re-evaluation of Negro employee skills.
- Institution of training programs to develop and improve Negro skills.
- Promotion and pay adjustment on the basis of such evaluation and/or training.
- Permitting qualified Negroes equal opportunity to apprenticeship programs and actively recruiting for such programs in Negro schools.

Other major areas of agreement include the posting and issuance of a new nondiscrimination policy statement, signed by the president of the company. This statement, which is to be attached to the paycheck of each full-time employee within 30 days from the date of the signing of the agreement, emphasizes the company's fundamental policy of providing equal opportunity in all areas of employment practice and assuring that there shall be no discrimination against any person on grounds of race, color, religion, or national origin.

The company plans to assemble all supervisory employees to read the policy statement to them, and advise them of the terms of the agreement. They will be informed that the importance of fulfilling company policy cannot be over-emphasized. They will be told that any violation of the let-

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DEPARTMENT OF DEFENSE

President Johnson has nominated General Earle G. Wheeler, USA, for his second two-year term as Chairman of the Joint Chiefs of Staff. General Wheeler succeeded General Maxwell D. Taylor as Chairman of the Joint Chiefs in 1964.

Maj. Gen. Earl C. Hedlund, USAF, has been named to succeed Maj. Gen. Francis C. Gideon, USAF, as Dep. Dir., Defense Supply Agency, effective in July.

Brig. Gen. William T. Smith, USAF, has been reassigned to duty as Chief of Staff, Defense Communications Agency.

E. Grogan Shelor, Jr., has joined the Department of Defense as Asst. Dir. of Defense Research and Engineering (Communications & Electronics). He succeeds Thomas F. Rogers, who has become Dep. Dir. of Defense Research and Engineering (Electronics and Information Systems).

Brig. Gen. Glen J. McClernon, USAF, will take command of the Defense Electronics Supply Center, Dayton, Ohio, in July.

Col. Robert E. Lee, USAF, has been designated Executive Dir. (Procurement and Production), Defense Supply Agency. His nomination for the rank of brigadier general has also been approved.

Col. William H. Herndon, USA, has been named to succeed Capt. Andrew M. McCrone, SC, USN, as Commander, Defense Depot, DSA Mechanicsburg, Pa. Capt. McCrone has been reassigned to the Navy Weapons Supply Activity, Washington, D.C.

DEPARTMENT OF THE ARMY

Dr. Marvin E. Lasser has succeeded Dr. Harold C. Weber, as Chief Scientist in the U. S. Army's Office of Research and Development.

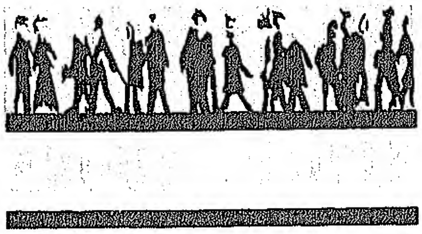
Lt. Gen. William B. Bunker, Dep. Commanding General, Army Materiel Command, was promoted to his present rank during ceremonies held in Washington, May 9.

The Army's top computer manager, Maj. Gen. J. E. Landrum, will retire July 31. He will be replaced in the position of Special Asst. to the Chief of Staff (Information and Data Systems) by Brig. Gen. Charles P. Brown, who has been designated for promotion to major general.

Brig. Gen. John R. Guthrie has been appointed Dir. of Developments in the Office of the Chief of Research and Development, U. S. Army.

Brig. Gen. Thurston T. Paul, Jr, has been selected as Dir. of Plans and Programs in the Office of the Chief of Research and Development.

Brig. Gen. Edwin L. Donley has assumed command of Land Combat Systems at the U.S. Army Missile Command, Redstone Arsenal, Ala. Gen. Donley was promoted to his present rank upon taking command.



Brig. Gen. Kenneth F. Dawalt has relieved Brig. Gen. William T. Ryder as Dep. Chief of Research and Development for International Programs in the Office of the Chief, Research and Development, U.S. Army. Gen. Ryder retires after 30 years of Army service.

Brig. Gen. Kenneth H. Bayer has been assigned as Dir. of Research and Development, U.S. Army Materiel Command, succeeding Maj. Gen. William C. Gribble, Jr.

Brig. Gen. Harold M. Brown has assumed duties as Dep. Chief of Communications-Electronics, Department of the Army. He succeeded Brig Gen. Lawrence P. Jacobs who has retired.

Col. Warren R. King has been named Chief of Staff, U. S. Army Electronics Command, Fort Monmouth, N.J. Col. George A. Kurkijian, who has been serving as Deputy and Acting Chief of Staff, will continue as Deputy.

Col. Willard Roper is slated for assignment as Dep. Dir. of Civil Works in the Office of the Chief of Engineers this summer. He is now serving as District Engineer at Louisville, Ky.

Col. Max McCord will succeed Col. Edwin J. Withers as Dir. of Real Estate in the Office of the Army Chief of Engineers, Washington, D.C. Col. Withers retired in November. W. L. Berge has been serving as Acting Director since the colonel's retirement.

DEPARTMENT OF THE NAVY

RAdm. Harry J. P. Foley, Jr., SC, Dep. Commander for Plans and Policy at the Naval Supply Systems Command, Washington, D.C. has been reassigned as Commanding Officer of the Navy Aviation Supply Office, Philadelphia.

RAdm. William F. Petrovic has been named Dep. Commander for Shipyards and Program Dir. for Shipyard Modernization at the Navy Ship Systems Command, Washington, D.C. He previously served as Commander, New York Naval Ship Yard.

DEPARTMENT OF THE AIR FORCE

Gen. Dean C. Strother, Commander-in-Chief, North American Air Defense Command/Continental Air Defense Command, is scheduled for retirement July 31, 1966. Lt. Gen. Raymond J. Reeves has been selected to succeed him. The new commander will assume his duties Aug. 1 and has been selected for promotion to four-star rank.

Maj. Gen. Glen R. Birchard has been picked to head the Air Force Alaskan Command. He will take command Aug. 1 and is nominated for promotion to the rank of lieutenant general.

Brig. Gen. Edward W. Scott, Jr., will become Commander, European Exchange Service, in July. He is now serving as Commandant, Air Command and Staff College, Maxwell AFB, Ala.

Col. Donald W. Bowry has been reassigned as Chief, Communications and Electronics Div., Directorate of Aerospace Programs, Headquarters, USAF.

Col. Leonard K. Carson has been named Dir. of Research Programs in the Office of Aerospace Research.

Col. James R. Carter, now serving with the Pacific Air Force, has been selected as Chief, Advanced Programs Office, F-111 Special Project Office, Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

Col. Dan McKee, former Commander of Space Systems Divisions' Detachment 2 at Houston, Tex., has assumed a new role as Dep. for Unmanned Systems, Space Systems Div., Air Force Systems Command, Los Angeles, Calif.

The Electronic Systems Div., Air Force Systems Command, L. G. Hanscom Field, Mass., announces the following changes:

Col. Emmett V. Conkling has been reassigned as Chief of the newly established Directorate of Communications Development. Col. Robert L. Edge has been named to relieve Col. Conkling as Dir. of the 473L USAF Command and Control System Program Office. Col. Robert J. Kuehn, now serving as Dep. for Command Systems, has been reassigned to the Joint U.S. Military Systems Group in Thailand. Col. Kuehn will be succeeded by Col. Paul G. Galentine who moves from his present position as Dep. for Engineering and Technology. Col. Roy Morgan will serve as Acting Dep. for Engineering and Technology.

Army-Air Force Exchange Service Will Move to Texas

The U. S. Army and Air Force Exchange Service, now headquartered in New York, will be relocated to the Fort Worth-Dallas, Tex., area with the move scheduled to be completed by summer 1967.

The switch is part of a three-year improvement plan to modernize the Exchange Service. It is estimated that the program will result in savings of more than $3 million a year.

The Exchange Service provides a world-wide service to the Army and Air Force by operating cafeterias, snack bars and sales and service outlets of various kinds at military installations in the United States and in 34 foreign countries.

(*Continued from Page 4*)

inappropriate while we are engaged in a shooting war.

But I believe precisely the opposite is the case. It is more appropriate now than ever. For it would underscore what our whole purpose is in Vietnam — and indeed anywhere in the world where coercion, or injustice, or lack of decent opportunity still holds sway.

It would make meaningful the central concept of security: a world of decency and development where every man can feel that his personal horizon is rimmed with hope.

Mutual interest, mutual trust, mutual effort—those are the goals. Can we achieve those goals with the Soviet Union and with Communist China? Can they achieve them with one another?

The answer to these questions lies in the answer to an even more fundamental question.

Who is man?

Is he a rational animal?

If he is, then the goals can ultimately be achieved.

If he is not, then there is little point in making the effort.

All the evidence of history suggests that man is indeed a rational animal, but with a near infinite capacity for folly. His history seems largely a halting, but persistent, effort to raise his reason above his animality.

He draws blueprints for Utopia, but never quite gets it built. In the end, he plugs away obstinately with the only building material really ever at hand: his own part-comic, part-tragic, part-cussed, but part-glorious nature.

I, for one, would not count a global free society out.

Coercion, after all, merely captures man. Freedom captivates him.

Small Business Success

(*Continued from Page 5*)

But the key to the success of Stencel Corp. is the fact that the Defense Department is not unapproachable for small companies, even in areas previously dominated by larger industries.

With this avenue of relationship open, new sources of expertise are continually being discovered by the Defense Department. And an inevitable product of this approach is the opportunity for a small business with competent people and original thinking to obtain the kind of work which will help it grow into a successful enterprize.

Advisory Committee To Study Maritime Competitive Bid Procedures

An advisory committee has been formed by the Navy to study and recommend means of establishing competitive bid procedures and cost analysis criteria for use by the Military Sea Transportation Service in dealing with the maritime industry. Formation of the group is in line with the recent ocean procurement policy statement of the Defense Department at a Federal Maritime Hearing held April 4, 1966.

The group will work closely with Vice Admiral Glynn R. Donaho, Commander, Military Sea Transportation Service. Members of the committee are:

Mr. Clarence Morse, Attorney, San Francisco, Calif. (Former Administrator, Federal Maritime Commission.)

Dr. Carl E. McDowell, Executive Vice President, American Institute of Marine Underwriters, New York City.

Mr. Alex C. Cocke, Marine Consultant, New Orleans, La (Retired Vice President, Lykes Steamship Lines.)

Because of the general public interest in the maritime field, and recent Congressional hearings on the subject of ocean rates and procedures, the committee will evaluate alternative methods of developing competitive ocean rate structures applicable to the Military Services. To establish criteria for the taxpayer the study group will furnish a format for analysis of cost data to insure the establishment of equitable rates for movement of military cargo.

It is also anticipated that establishment of this advisory committee will promote better understanding of ocean procurement problems under consideration by both military and industry.

Landing System Tested by Air Force

The Air Force is testing a new tactical approach and landing system called IRATE (Interim Remote Area Terminal Equipment) to be used in Southeast Asia.

The system, which will provide an interim letdown capability under low visibility conditions, is based on accelerated development and evaluation of off-the-shelf terminal equipment.

Capabilities of two systems are now being studied at the Air Force Instrument Pilot Instructor School, Randolph AFB, Tex., for use in cargo extraction, paradrop and approach for assault landing.

The two systems are the Tactical Landing and Approach Radar (TALAR) built by General Precision Laboratories and the Simplified Tactical Approach and Terminal Equipment (STATE) built by Honeywell, Inc.

The IRATE program was established by the Joint Service Tactical Approach and Landing Working Group and is under the technical management of the Air Force Flight Dynamics Laboratory of the Air Force Systems Command, at Wright-Patterson AFB, Ohio.

USAF To Contract for UFO Investigations

The U. S. Air Force is taking steps to strengthen its program for the investigation of reports of unidentified flying objects (UFO) by seeking the aid of scientific and educational institutions.

Aid will be sought through contracts calling for prompt, in-depth investigation of selected UFO reports. Air Force officials are now discussing the project informally with university and other scientific leaders to determine their interest.

Decision to award the contracts was based on a recommendation by the Air Force Scientific Advisory Board which reviewed the resources, methods and findings of Project Blue Book, the Air Force program to investigate and evaluate UFO reports.

In its report, which was submitted to the Air Force in March, the investigating committee recommended expanding the program to include investigation of selected sightings by independent scientists.

The Air Force is preparing work statements for the new contracts now. Funds for them will be requested from FY 1967 and FY 1968 budgets.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July 65–March 66	July 64–March 65
Procurement from All Firms	$22,771,684	$17,501,728
Procurement from Small Business Firms	4,903,686	3,627,720
Percent Small Business	21.5	20.7

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> Each Defense Procurement Circular is designed to place new or changed policy or procedures in effect prior to publication of an Armed Services Procurement Regulation (ASPR) revision. ASPR subscribers will receive DPC's and ASPR revisions through the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

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Proceedings of the Conference on Atmospheric Contamination in Confined Spaces. Air Force Aerospace Medical Research Laboratories, Dec. 1965, 324 pp. Order No. AD-629-622. $7.

A Thermal Radiation Heat Source and Imaging System for Biomedical Research. D. L. Richardson, Arthur D. Little, Inc., Cambridge, Mass., for the Navy, Dec. 1965, 48 pp. Order No. AD-629 590. $2.

Laminar Flow Regimes for Rigid-Sphere Suspensions. Itek's Research and Development, Palo Alto, Calif., for the Air Force, Feb. 1966, 79 pp. Order No. AD-629 312. $3.

Optical Communications Employing Semiconductor Lasers. MIT's Lincoln Laboratory for the Air Force, June 1965, 73 pp. Order No. AD-630 243. $3.

Investigation of Precision Antenna Pattern Recording & Display Techniques. Scientific-Atlanta, Inc., Ga., For the Air Force, Feb. 1966, 157 pp. Order No. AD-630 124. $5.

Improved Heat Transfer in Multistage Flash Evaporation. Naval Civil Engineering Laboratory, Port Hueneme, Calif., Dec. 1965, 29 pp. Order No. AD-625 267. $2.

Table of Thermodynamic Properties and Chemical Composition of Nitrogen in Chemical Equilibrium Including Second Virial Corrections from 1600°K to 15,000°K. National Bureau of Standards, for the Air Force, April 1966, 309 pp. Order No. AD-630 461. $7.

Evaluation of Inorganic Nitrates as Heat Test Standards. Army Picatinny Arsenal, Dover, N.J., Dec. 1965, 46 pp. Order No. AD-626 171. $2.

Experimental Study of Zone Refining of the Binary System Triphenyl Antimony—Naphthalene. Solid State Sciences Laboratory, Hanscom Field, Mass., Jan. 1966, 77 pp. Order No. AD-630 609. $3.

Fracture Behavior of Titanium in the Marine Environment. U.S. Navy Marine Engineering Laboratory, Annapolis, Md., July 1965, 48 pp. Order No. AD-467 088. $2.

Property Investigation of Copper Base Alloys at Ambient and Elevated Temperatures. ARO Inc., for the Air Force, July 1965, 46 pp. Order No. AD-467 015. $2.

Survey of Current Knowledge of the Deformation Characteristics of Beryllium, the Refractory Metals and the Superalloys. Battelle Memorial Institute, Columbus, Ohio, for the Navy, Feb. 1966, 322 pp. Order No. AD-630 427. $7.

A Multiaxial Fatigue Test for Evaluation of Plastics Composite Materials. Naval Ordnance Laboratory, White Oak, Md., Feb. 1966, 81 pp. Order No. AD-630 434. $2.

Investigation of the Physical-Chemical Nature of the Matrix-Reinforcement Interface. Dow Corning Corp., Midland, Mich., for the Air Force, Sept. 1965, 144 pp. Order No. AD-629 777. $4.

Investigation of a Laser Triggered Spark Gap. Air Force Institute of Technology, Wright-Patterson AFB, Ohio, March 1966, 27 pp. Order No. AD-629 905. $2.

New Sources of Electrical Energy for Ships. Russian work dated 1965 and translated by the Navy, 122 pp. Order No. AD-630 285. $4.

Investigation of Cathode Phenomena in the Mercury Arc. Space Sciences, Inc., Waltham, Mass., for the Air Force, Feb. 1966, 146 pp. Order No. AD-629 869. $4.

Human Factors as they Affect Methods Improvement in Construction. Stanford University, for the Navy, Sept. 1964, 65 pp. Order No. AD-628 940. $3.

> Government Research and development reports are available to science and industry at price indicated from:
> Clearinghouse for Federal And Scientific Information
> Department of Commerce
> Springfield, Va. 22151
> Authorized DOD contractors and grantees may obtain these documents without charge from:
> Defense Documentation Center
> Cameron Station
> Alexandria, Va. 22314

The Minuteman Missile Power for Present and Future

by
Maj. Gen. H. J. Sands, Jr., USAF
Commander, Ballistic Systems Div.
Air Force Systems Command

When industry visitors to our Ballistic Systems Division (BSD) headquarters at Norton AFB, Calif., query us on what's new, the answer is mostly, "Minuteman."

In an era which may seem deceptively quiet after the days when we were deploying three different types of missiles simultaneously, the Minuteman has proved itself much more than the solidly established mainstay of our present operational missile strength. It is demonstrating that it is also the best grafting stock developed to date in our United States missile program. Its remarkable potential for improvement bids fair to make this latest and liveliest of our long-range aerospace weapons the Methuselah of U. S. strategic missiles—with the difference that longevity does not mellow, but magnifies, its capabilities.

This capacity for flexible evolution makes the Minuteman not only continuing news, but a one-package summary of technological trends and progress at any given time. Indeed, a major problem, since development of the system was begun in 1958, has been to freeze its evolution even long enough to get an operational force deployed. Consideration of present Minuteman development and planning is one of the most effective means of getting a bird's eye view of significant trends in ballistic system weaponry. The Minuteman accurately reflects both the remarkable accomplishments of industry in missile technology, and the continuing emphases and needs of the Air Force.

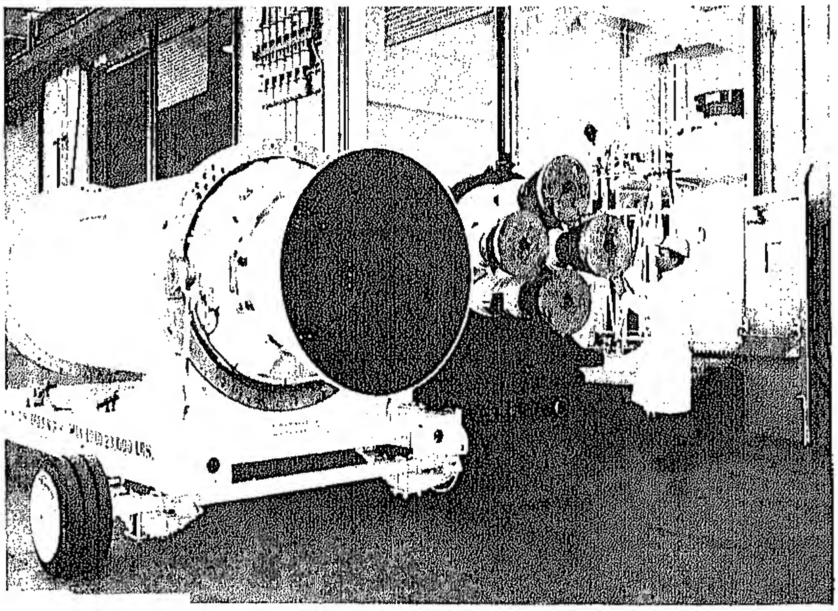
We now have an operational Minuteman force of better than 800 missile systems on operational alert. ... on the ... to be ... Cape Kennedy and Vandenberg AFB, incorporates the results of major advances of the past several years in missile technology. A greatly modified guidance and control system features microminiaturized electronics and gives the missile twice the accuracy of Minuteman I. The missile will have a new capability for launch by signal from SAC's airborne command post. Modification of the ground environment decreases the vulnerability of the weapon system to enemy attack. Greater flexibility of targeting has also been built into this new version of the Minuteman.

The most fundamental change in the Minuteman II, however, is its second-stage engine with a larger engine chamber loaded with an improved propellant which delivers nearly 50 percent more total energy. End result of this and other propulsion improvements is an increase of more than 2,000 miles in the range of the missile or an option for a significant increase in payload.

The first five wings of our Minuteman force are scheduled to be converted from the Minuteman I to the Minuteman II in a billion dollar force modernization program which is just getting under way. The existing silos and ground equipment with necessary modifications will be used for the Minuteman II missiles. At a fraction of the cost of deploying a new weapon system, we will be able to graft upon the Minuteman I stock modification which, in actual fact, will give us the capabilities of a new, greatly advanced weapon system.

And now, waiting in the wings for development and announced by President Johnson in his January budget request to Congress, is the Minuteman III.

Even the Minuteman cannot go on forever, of course. To attempt to push too far reliance upon its adaptability would be a dangerous delusion. The time must inevitably come when the state of the art bursts the seams of the whole missile system as originally conceived, when modifications overwhelm the original configuration and are no longer practical, and a total new integrated approach is needed. That is why we have already begun studies on at least two other missile systems to supplement or supersede the Min-



The size of the second stage solid propellant rocket motor of the new Minuteman II ICBM is compared with the smaller second stage motor for Minuteman I. The Minuteman II unit, with its single nozzle, is larger, more powerful and has a greater range than the older four-nozzled model. The older vehicle is steered on command, while Minuteman II is maneuvered by liquid injections into the nozzle which deflect the exhaust stream.

uteman, depending upon developments.

Any missile which succeeds the Minuteman, or supplements it in years to come, will be the direct lineal descendant of the "instant missile" in most significant respects. Many of the technological building blocks which will be used in future missiles are being developed now for the Minuteman, are being put to the test in its successive versions, and refined and re-designed in the light of our advancing experience with the "ace-in-the-hole."

Propulsion advances, for instance, which account for the greatly extended range of the Minuteman II, foreshadow even more significant developments of the near future. The new propellant, which has the jaw-breaker name of carboxy-terminated polybutediene, has a much higher specific impulse than the solid fuel used in earlier versions of the missile. Its greater punch is further augmented by the use of a single nozzle, which is more efficient than the previous four nozzles, and by a liquid injection thrust vector control system for control of the missile during second-stage operation. This last makes the missile more quickly responsive to the commands of its guidance and control system.

Of course, our work in propellants goes far beyond what is embodied in present versions of the Minuteman. We are also investigating both larger and small propulsion systems, and doing extensive nozzle research. We are studying storable metallized thixotropic fuels—jelled propellants holding metal powder in suspension —which combine some of the best properties of solid and liquid cryogenic fuels. We are exploring adaptation of the Polaris "cold launch," i. e., propelling a missile from the silo by gas and igniting it in the air. The launch site chosen for our work with cold launch techniques to date is a Minuteman silo.

The Minuteman II also reflects the active research going forward today to develop new materials for high temperature ballistic system applications and light-weight materials of great tensile strength, special shielding properties against radiation and special qualities for minimum radar "observability." In the gimbal structure of the Minuteman II, for example, we have the first large usage of beryllium, the lightest in weight of all stable metals, much lighter than steel, yet stronger.

In the area of guidance and control, too, one of the highest pay-off areas in terms of mission effectiveness, the Minuteman II is a trail blazer. In addition to the tremendous savings in weight and bulk, the microminiaturized integrated circuits of the system create the "most performance per pound" we have yet been able to condense into a missile system. A modified guidance and control coupler is the electronic link between the missile's digital computer "brain" and the missile combat crew located in a launch control facility.

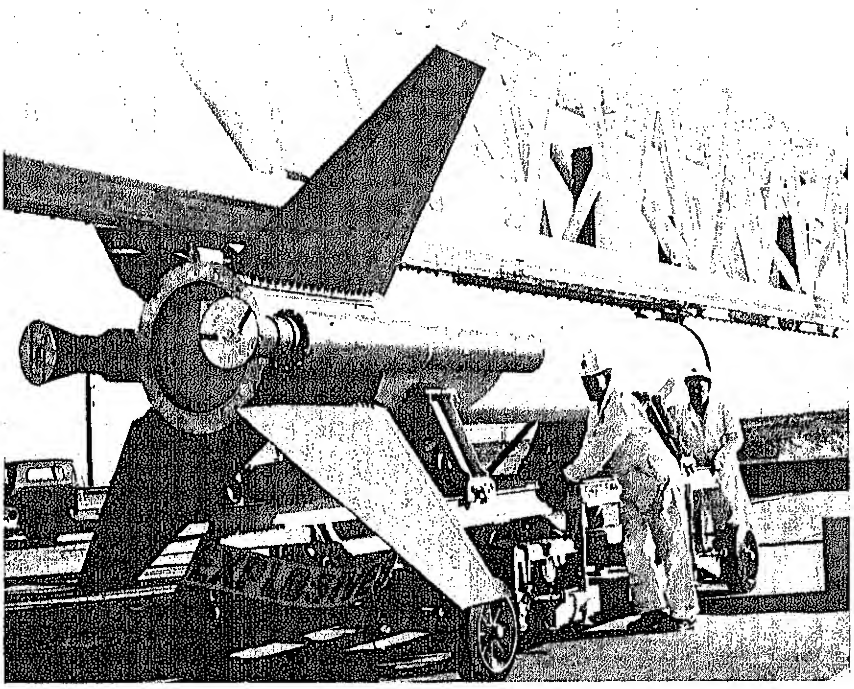
Though Minuteman II's guidance system doubles the accuracy of the missile, we are still pushing for improvements through such additional aids to the basic inertial guidance system as radio, stellar tracking and terminal guidance.

One of the most active areas of progress in the ballistic missile effort is re-entry technology. At Ballistic Systems Division headquarters we run a joint Air Force-Army-Navy program called ABRES (Advanced Ballistic Re-Entry System). Of all our individually designated programs, ABRES, next to the Minuteman itself, receives the largest share of our BSD resources and energies.

Its purpose is to develop the technological base for progressively improving the capabilities of our re-entry systems. Unlike "new wine in old bottles," a new re-entry system on an "old" missile can be an economical route to great gains in mission capability. Among the major efforts in this program are:

- Improving the material makeup of re-entry systems to survive the natural hazards of re-entry into the atmosphere.
- Improving the accuracy with which the system finds its target.
- Devising decoys and other means of evading or confusing enemy anti-missile action.
- Increasing the effective payload which can be delivered by each missile launched.

A special four-stage, sub-scale missile, the Athena, has been developed to test new re-entry system concepts and designs. It is launched from heavily instrumented facilities at Green River, Utah, to impact on



The first stage motor for the Athena test missile is maneuvered in position on launching tracks. It will be mated with the second stage, then finally with the accelerating package which carries the third and fourth stages and the needlenosed re-entry vehicle. This is a scaled down model of an intercontinental ballistic missile (ICBM) nosecone in which various types of warhead aids are tested.

the test range at White Sands, N. M. Full-scale testing is done with modified Atlas boosters launched over the Western Test Range out of Vandenberg AFB.

The Minuteman has been our No. 1 "customer" for ABRES and industry re-entry system developments. With each successive re-entry system the weapon system as a whole has taken on a different character and increased capabilities. We have Minuteman missiles with three different re-entry systems in our presently deployed operational force. The Mark 12 re-entry system will be one of the major improvements in the future. The Mark 17 re-entry vehicle is intended for use on both the Minuteman II and III. The excellent results which can be obtained by grafting improved re-entry system capabilities upon the Minuteman are an important factor in keeping the weapon system abreast of our defense requirements far beyond the normal life expectancy of such a system in today's climate of rapid technological evolution. When we do finally retire this hardy little Methuselah of missiles, it will leave to its successors, as an invaluable "building block," a decade of concentrated, practically tested progress in the re-entry field.

The Minuteman promises to have as many lives as a cat. And in each one of them it is making a contribution to both our present and our future deterrent defenses.

Economic Information System Reports Approved by Bureau of the Budget

The Bureau of the Budget (BOB) gave approval during May 1966 to the semi-annual contractor reporting requirements prescribed by the Department of Defense and National Aeronautic and Space Administration Economic Information System (EIS). BOB's approval followed extensive coordination with industry representatives by Defense and NASA officials.

The Economic Information System was developed jointly by DOD and NASA. The DOD effort is under the direction of Dr. Stephen Enke, Deputy Assistant Secretary of Defense (Systems Analysis) for Economics.

This system is one of several DOD projects designed to measure the economic impact of defense programs. Although the policy of DOD is such that economic impact will not influence program acquisition decisions, it is important that DOD as well as state, local and other organizations, take such actions as may be desirable to alleviate adverse consequences of shifts in defense procurement programs.

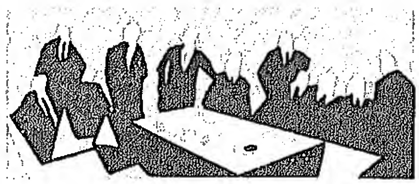
EIS originated in 1961 as part of an effort to assess the economic impact of defense procurement on plants and communities. In 1965 BOB gave data on total employment according to four major categories—DOD, NASA, Other Government, and Commercial.

The Individual Project Report provides data on employment, costs, cost distribution over time and contract information, and will be prepared for each individual project (major weapon system or major element thereof) having 150 or more direct workers on the project.

One of the series in the Defense Contractors Planning Report (DCPR), the DD Form 1401 (Plant Data), is deleted as a reporting requirement by EIS.

Report forms and instructions were mailed to approximately 500 plants during May 1966. Completed reports were to be submitted within 30 days of receipt. This first report will contain actual data for the six month periods ending June 1965 and December 1965 and forecasts of firm business based on contracts awarded through April 30, 1966.

Although both the Economic Information System and the Cost Information Reports are designed to collect data on weapon systems development and production, they have



MEETINGS AND SYMPOSIA

JULY

First International Conference on Hemorheology, July 10–16, at the University of Iceland, Reykjavik, Iceland. Sponsor: Office of Naval Research. Contact: Miss Suzanne Kronheim, Physiology Branch (Code 441), Office of Naval Research, Washington, D.C., 20360 (Area Code 202) OXford 6-1795.

National Classification Management Society 1966 Seminar, July 13–15, in Los Angeles, Calif. Non-members who desire to attend contact: Mr. Richard J. Boberg, Seminar Chairman, NCMS National Seminar, P.O. Box 2089, Culver City, Calif., 90230.

ICRPG/AIAA Solid Propulsion Conference, week of July 18, in Washington, D.C. Contact: Mr. P. J. Martin, Chemical Propulsion Information Agency, 8621 Georgia Ave., Silver Spring, Md., 20910. (Area Code 301) 589-7700, ext. 560.

1966 Annual Conference on Nuclear and Space Radiation Effects, July 18–22, at Stanford University, Palo Alto, Calif. Sponsors: Army Research Office, Institute of Electrical and Electronics Engineers, National Aeronautics and Space Administration, Office of Naval Research and the Air Force. Contact: Lt. Col. J. E. Houseworth, Physical Sciences Div., Army Research Office, Washington, D.C. (Area Code 202) OXford 4-3446.

Third International Pharmacology Congress, July 24–30, at University City, Sao Paulo, Brazil. Sponsors: Brazilian Federal Government, Government of the State of Sao Paulo, University of Sao Paulo and the U.S. Air Force Office of Scientific Research. Contact: Dr. Harvey E. Savely, (SRL), Air Force Office of Scientific Research, Tempo-D, 4th and Independence, S.W., Washington, D.C. (Area Code 202) OXford 6-6189.

AUGUST

Electron Spin Resonance Spectroscopy Seminar, Aug. 1–3, at Michigan State University, East Lansing, Mich. Sponsors: Army Research Office-Durham, Atomic Energy Commission, American Chemical Society and Michigan State University. Contact: Dr. David R. Squire, Chemistry Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C., 27706. (Area Code 919) 286-2285.

1966 Linguistic Institute Conference on Linguistic Method, Aug. 1–3, at the University of California at Los Angeles. Sponsor: Air Force Office of Scientific Research. Contact: R. W. Swanson (SRI), Air Force Office of Scientific Research, Washington, D.C., 20333. (Area Code 202) OXford 6-5374.

Eleventh International Symposium on Combustion, Aug. 14–20, at the University of California, Berkeley, Calif. Co-sponsors: Ballistic Research Laboratory and the Combustion Institute of Pittsburgh, Pa. Contact: Dr. R. J. Heaston, Physical Sciences Div. Army Research Office, 3045 Columbia Pike, Arlington, Va., (Area Code 202) OXford 4-3465.

Second Computer & Information Sciences Symposium on Learning, Adaptation and Control in Information Systems, Aug. 22–24, at Columbus, Ohio. Sponsors: Office of Naval Research, Battelle Memorial Institute and Ohio State University. Contact: Julius T. Tou, COINS Co-Chairman, Director, Communications Science Research Center, Battelle Memorial Institute, Columbus, Ohio, 43201.

Application of Generalized Functions to System Theory Conference, Aug. 25–26, at the State University of New York, Stony Brook, N.Y. Co-sponsors: Air Force Office of Scientific Research and Society for Industrial and Applied Mathematics. Contact: Capt. John Jones, Jr. (SRMA), Air Force Office of Scientific Research, Washington, D.C., 20333. (Area Code 202) OXford 6-1302.

Unguided Rocket Ballistics, Aug. 30–Sept. 1, at Texas Western College, El Paso, Tex. Sponsor: Army Electronics Research & Development Agency. Contact: V. C. Cochran, Army Electronics Research & Development Agency, White Sands Missile Range, N.M., 88002.

Logic, Computability and Automata, date and place undetermined. Co-sponsors: Hughes Aircraft Co. and the Rome Air Development Center. Contact: C. A. Constantino (EMID), Rome Air Development Center, Griffiss AFB, N.Y., 13440.

Ocean Electronics Symposium, Aug. 29–31, at Honolulu, Hawaii. Sponsor: Hawaii Section, Institute of Electrical and Electronics Engineers (IEEE). Contact: Robert R. Hill, Chairman, IEEE Ocean Electronics Symposium, Headquarters, 1441 Kapiolani Blvd., Suite 1320, Honolulu, Hawaii 96814.

SEPTEMBER

U.S. National Committee for Pure and Applied Biophysics in connection with the Second International Biophysics Congress, Sept. 5–9, in Vienna, Austria. Sponsor: Office of Naval Research. Contact: Mrs. P. H. Tenniswood, Code 444, Office of Naval Research, Washington, D.C., 20360. (Area Code 202) OXford 6-1538.

Symposium on Galio-Marinide, Sept. 26–27, in Wales and England. Sponsor: Research and Technology Div., AFSC. Contact: R. W. Runnells (AVN), Air Force Avionics Laboratory, Research and Technology Div., AFSC, Wright-Patterson AFB, Ohio, 45433. (Area Code 513) 253-7111, ext. 53802.

Sixth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Sept. 26–28, at Princeton, N.J. Sponsor: Naval Air Turbine Test Stations. Contact: Dennis A. Wysocki, Conference Vice Chairman, Naval Air Turbine Test Station, P.O. Box 1716, 1440 Parkway Ave., Trenton, N.J., 08607. (Area Code 609) 882-1414, ext. 355.

Sixth Symposium on Naval Hydrodynamics, Maneuverability, Waves and Physics of Fluids, Sept. 29–30, Oct. 3–4, at Washington, D.C. Sponsor: Office of Naval Research. Contact: Mr. S. W. Doroff, Office of Naval Research, Code 438, Washington, D.C., 20360. (Area Code 202) OXford 6-1433.

OCTOBER

Tenth Annual Organic Chemistry Conference, Oct. 4–5, at Natick, Mass. Co-sponsors: Army Natick Laboratories and the NAS–NRC Advisory Board on Military Personnel and Supplies. Contact: Louis Long, Jr., Head, Organic Chemistry Laboratory, Army Natick Laboratories, Natick, Mass. (Area Code 617) 653-1000, ext. 414.

Colloquium on the Photographic Interaction Between Radiation and Matter, Oct. 26–27, at Washington, D.C. Co-sponsors: Air Force Office of Scientific Research and the Society of Photographic Scientists and Engineers. Contact: Dr. Amos G. Horney (SRC), Air Force Office of Scientific Research, Washington, D.C., 20333. (Area Code 202) OXford 6-8705.

Packaging Courses Open To Defense Industry

The Joint Military Packaging Training Center, Aberdeen Proving Ground, Md., has announced that industrial representatives will be accepted for enrollment in the extension course program.

Industry students should be supervisory level personnel, packaging specialists, or packaging engineers. Enrollment is limited to business concerns which have contracts with the Defense Department.

Training covers the approved DOD policies, methods and techniques of military preservation, packaging, packing, inspection, loading of military supplies and equipment, and specialized courses as established by current Government specifications and other military directives.

For information contact: Director, Joint Military Packaging Training Center, Attn: AMXPT-A, Aberdeen Proving Ground, Md. 21005, phone (Area Code 301) 272-4000.

Courses available are:

Course Number & Title	Length
8B-F1(JT)—Preservation & Intermediate Protection, Phase I.	2 weeks
8B-F2(JT)—Packing & Carloading, Phase II.	2 weeks
822-F4(JT) — Basic Packing.	2 weeks
8B-F3(JT)—Preservation & Packaging, Phase III.	1 week
8B-F5(JT)—Missile Packaging.	2 weeks
8B-F6(JT) — Equipment Preservation for Shipment or Storage.	2 weeks
8B-F7(JT)—Preparation of Freight for Air Shipment.	1 week
8B-F8(JT)—Inspection of Packaged & Packed Household Goods for Storage & Shipment.	1 week
8B-F4(JT)—Packaging Administration.	3 days
8B-F16(JT) — Packaging Design	2 weeks

Army To Get New Portable Combat X-Ray Units

Army medics will soon have the help of X-Rays in treating combat wounds right on the battlefield through the use of a new lightweight X-Ray unit and a portable, spring-drive X-ray polaroid film processor. Designed for rugged use by forward area medical units, both pieces of equipment have been tested successfully in Vietnam under combat conditions.

Air Force Expands BUIC Aerospace Control System

The Air Force has launched a development program aimed at strengthening the nation's secondary aerospace control system known as BUIC (Back-Up Interceptor Control).

BUIC's D825 electronic computers, which provide a high-speed surveillance and control system furnishing up-to-the-minute information on airborne threats to the North American continent, will be enlarged under the program and additional TV-type display consoles added at each site to increase defense posture.

BUIC is a stand-by, monitor system which automatically takes over the continental air defense task if the Air Force's primary system, SAGE (Semi-Automatic Ground Environment), becomes inoperative.

To accomplish the expanded capability of BUIC the Air Force Systems Command's Electronic Systems Division has awarded a $14,050,000 contract to the Burroughs Corp. of Paoli, Pa.

Overall management of the BUIC program is provided by the 416M System Program Office headed by Colonel Frank L. Ayres, at the Air Force Systems Command's Electronic Systems Division, L. G. Hanscom Field, Mass. Systems engineering is provided by the Mitre Corp. and computer programming for the system by the System Development Corp.

AIR FORCE AND FAA DEVELOP ALL-WEATHER LANDING SYSTEM FOR C–141

An all-weather landing system, developed jointly by the U.S. Air Force and the Federal Aviation Agency, will be installed on all C–141 Starlifters. The new landing system will enable the huge fanjet cargo-troop carriers to land safely under adverse weather conditions, at both improved airfields and in remote or combat areas where a minimum of ground-landing aids may be available.

The system, while similar to those in use in commercial aircraft, is more complex because it must be more nearly self-sufficient. Its basic function is to program the aircraft's flight path, speed, angle of approach and attitude at various points in the approach and touchdown path. The system will generate and provide the necessary information either to the pilot, who then flies the proper path and speeds, or to the autopilot which flies the plane automatically.

DOD Technical Term Glossary Available

The Defense Department has issued a new glossary of scientific and technical terms used in its technical data and standardization programs.

Under the title "Department of Defense Technical Data and Standardization Glossary," the new manual is based on several previous but less comprehensive compilations and includes terms found in directives, instructions, regulations and orders relating to these programs.

Copies of the glossary are available to industry representatives by order from the U.S. Naval Supply Depot 5801 Tabor Ave., Philadelphia, Pa. 19120.

Navy Authorized Data List

(*Continued from Page 9*)

forms for common DOD data items, considers that use of standard generalized data forms may not be practicable for coverage of many uncommon data items when such items are adequately covered by existing source documents. Further, standard generalized data forms may not be practicable for data requirements covered by coordinated DOD specifications.

Industry's assistance is needed in the undertaking and coordination of the DADL. With adequate support from industry, the Navy feels confident that the task group will develop a practical and useful DOD Authorized Data List.

Equal Employment Opportunity

(*Continued from Page 10*)

ter or spirit of company policy by any employee shall result in disciplinary action including, where appropriate, termination of employment.

While a great deal remains to be done in carrying out the terms of the agreement its effect has already been noted. The National Association for the Advancement of Colored People has referred to the agreement as "exemplary." Donald A. Holden, president of the Newport News Shipbuilding and Drydock Co., stated, "We are proud of our part in working out this agreement." He added that the agreement represented an effective and responsible effort to achieve genuine equality of opportunity for Negroes.

"Echo" Revision of MIL-P-116 Published

by

Oscar Gayle
Joint Military Packaging Training Center
Aberdeen Proving Ground, Md.

Have you ever had trouble distinguishing between the letters Bee, Cee, Dee and Eee? You are not alone—so have the Military and Government Services. The international phonetic alphabet adopted after World War II further clarified the system to reduce the audible misunderstanding of those letters that sound alike and has proved very effective.

Packaging procurement and operations are keyed directly to our specification system, whose revisions and amendments are indicated by many same sounding letters, so we want to make it clear that MIL-P-116 "Echo" has arrived. After extended discussions, Service-wide coordinations and compromises, the "Echo" revision of MIL-P-116, "Preservation, Methods Of," was published Nov. 1, 1965, superseding MIL-P-116 "Delta" dated Sept. 29, 1960.

To those engaged in military packaging, this revision is very important as the new specification includes several major changes which will have wide impact.

Deletions and additions have been made to the list of P-type preservatives and methods of unit protection, and significant changes have been made in the quality assurance provisions. Because of these changes, the list of applicable documents, section 2 of the specification, also had to be revised.

One of the most evident changes in MIL-P-116E is in table I the listing of military approved temporary preservative compounds. Five long familiar preservatives have been deleted. They are the petrolatum based compounds P-4 and P-5 (classes 2 and 3 of MIL-C-11796); one rust inhibited oil, P-8 (MIL-L-3503); one special preservative for brightwork, P-13 (MIL-W-3688); and the thixotropic oil, P-16 (MIL-C-5545). P-19, identified as grade 4 of MIL-C-16173, was previously added by Amendment No. 1 to MIL-P-116; and this latest revision adds P-20, lubricating oil, contact and volatile corrosion inhibitor treated. This preservative oil should turn out to be one of our most useful preservatives, especially in the preparation of vehicles for storage, as the VCI vapors will penetrate to almost inaccessible areas and greatly enhance the overall protection of many critical parts.

Here we can recognize definite signs of progress in preservation techniques. Hard drying, gummy compounds, difficult to apply and still more difficult to remove, are giving way to multipurpose, easy-to-use, preparations which are more than equivalent in their protective abilities.

Another far-reaching change which also reflects current technology in the state of the art is in the section of methods of unit protection. Here we find that not only have five rarely used submethods of packaging been deleted and two new ones, which embody the latest in packaging techniques, added but a whole new family of packaging materials has been included. These are the unsupported plastic films of Military Specifications MIL-F-22191.

The submethods that have been deleted are IA-1, IA-2, IA-7, IC-5 and IC-6. IA-1 and IA-2, the wax-dipped packages, have proven to be quite expensive to fabricate as they require a good deal of manual labor. There has been no question as to the effectiveness of these packages; but, aside from being costly, the protection they afford is duplicated by the IA-8 and the IA-15. The IA-7, vacuum pack, is now designated as an optional variant of the IA-5, the all-metal sealed container.

The submethod IC-5 package, a water-resistant fiberboard box, sealed, has been redesignated as a method I (if a preservative has been used on the item) or a method III (if no contact preservative has been used).

Submethod IC-6 has not been proven any more effective than the IC-1, the IC-3 or the IA-8, any of which would be acceptable substitutes.

The two added submethods, IC-7 and IC-8, are especially adaptable to the packaging of bearings and other small critical parts.

Submethod IC-7 consists of a compartmented heat sealed plastic package made of a rigid cellulose acetate, cellulose acetate butyrate, or cellulose propionate. Each compartment holds one item which has been dipped in preservative oil. The compartments are separated by score lines, making it an easy matter to break off one compartment while leaving the remainder intact.

The IC-8 is designed for the plastic packaging of larger items of regular shape. A plastic cup is formed, again using one of the materials specified for the IC-7 above, which allows a minimum clearance for the item. The item, dipped into a preservative oil, is placed in the cup; and a telescoping cup is formed to close the package. The seam is chemically sealed by the use of a plastic solvent.

This change does not reflect the only use of plastics in packaging that occurs in MIL-P-116E. Polyethylene film (L-P-378) and types I, II, and III of MIL-F-2211, transparent packaging film, are included in many of the submethods as acceptable substitutes for the opaque packaging materials that have been specified in the past.

The advantages of transparent plastic packaging have been recognized by industry for many years. In the past few years some military contracts have specified the use of plastic bags and wraps, and some of the military organizations have used them extensively.

With the development of the water-vaporproof, greaseproof film that complies with the requirements for type I of MIL-F-22191, it is now possible to use transparent plastic films over the whole spectrum of protection from method III, which is designed for mechanical and physical protection only, to the highly water-vaporproof desiccated package of method II. Films conforming to types II and III of this specification afford moderately water-vaporproof and greaseproof protection (type II) and waterproof (type III).

Although types I and II are relatively expensive, they will find many uses where transparency and reduction of tare weight are factors. While inspection requirements have not been drastically changed, users of MIL-P-116 will find that the specific tests are no longer detailed in the specification but are included by reference to the appropriate tests of Federal Test Method Standard No. 101. This is in keeping with the Department of Defense Standardization Program which requires that detailed information will not be duplicated from document to document.

Procurement personnel, packaging engineers and packagers will find that MIL-P-116E is a much broader specification than its predecessors and is a forward pointing sign post along the road to better, less costly packaging.

Military Exports

(Continued from Page 7)

maintain a reasonable stability through balance of forces as they are a problem of considering the effects of over $750 million in arms poured into Egypt by the Soviets through 1964.

Problems from a Protectionist Point of View.

Finally, I would like to cover the problem of military exports in terms of world affairs by examining a problem which manifests itself in Europe and, particularly, in the consideration of the U. K. aerospace industry. I suppose we could say that no one objected about military exports during the 1950's when the foreign assistance program was paying for it and, therefore, no one can properly object to such exports now. However, there are always people who view their problems from a protectionist point of view. We know such men exist here and they also exist in Europe.

We would not wish to react to these protectionist interests in Europe from a narrow view of our own. The result would certainly be counter productive to our own military export efforts and would make it increasingly difficult for defense ministers interested in increasing defense return for economic investment to buy from the United States. We have much broader interests—interests which will require the U. S. response and approach to be as ingenious as it is vigorous. We must establish by our actions in Government and industry that there is merit in an orientation towards the United States. We must sell the benefits of collaboration in defense matters with competition. We must demonstrate that the free world has more to gain from the U. S. model of defense competition than it has from the temptation to allocate the market and build little, safe, high-cost arrangements across national borders.

These are problems that we must all work on—problems that we have not resolved, problems which the policy management of our Government and our industry must consider.

A recent UK aircraft industry report is indicative of the frustrations and consequent protectionism that is arising in Europe. I would like to cite some of the more significant elements of that report which exemplify the problem:

- After dealing with the character of the aerospace industry as one involving heavy investments of research and development and tremendously expensive products in terms of the past, the UK report states (a) that the U. S. aircraft industry output per man is estimated at three to three and a half times that of the United Kingdom; (b) that the U. S. pay is two and a half times that of the United Kingdom; and (c) that the U. S. worker has three to three and a half times as much fixed assets supporting him as the UK worker.

- After continuing an examination of relative production runs between the United States and the United Kingdom, the UK report notes that the United States buys 75 percent of free world military and space production and 50 percent of the free world civilian production, that the United Kingdom buys one-twelfth as much as the United States, and that the United Kingdom plus the common market buys one-fourth as much as the United States.

- The UK report notes the major factor in the success of the U. S. foreign sales program is early delivery—U. S. delivery generally reduces development by one year relative to that of the United Kingdom. They note lack of productivity in their industry, excessive delay in delivery, insufficient export promotion, inadequate market research and general governmental obstacles as the reasons for their difficulties—although they have just pointed out that they sell more abroad than does the United States.

A leading American manufacturer was with me recently in London and, in speaking to some key representatives of the United Kingdom, heard this intonement of fear against the American aerospace industry. He told me that up until that moment he just had never even thought about an American industry competing with a UK industry. He said that he spent all his time figuring out ways and means to compete with the Boeing's, the Douglas's, the Lockheed's, the North American's, the General Dynamics's and the McDonnell's. He said to our British friends that, if they really wanted to do business in the aerospace world, they had better start worrying about the specifics of competing with companies, since there was no American aerospace industry with which they were competing.

This is only the surface of the problem. The UK aircraft report did go far enough to make an analysis of the net tariff rate that was being applied by the following protectionist lines. The report noted:

> **On the basis of an annual development investment of 100 million pounds and an annual aircraft production of 320 million pounds, and assuming a U. S. production cost 90 percent that of the United Kingdom, the United Kingdom could have acquired 420 million pounds of production from the United States at a production cost of 288 million pounds and a development cost of 33 million pounds. This cheaper U. S. alternative is equivalent to a tariff of 99 million pounds, or just over 30 percent. If U. S. production cost is assumed to be 80 percent of UK production cost, the equivalent "tariff" is $7.56. These tariffs are probably understated since the United States sells abroad its more successful aircraft which have longer production runs and higher learning-curve savings, e.g., the Phantom run is about nine times that of the Lightning. The committee concludes that the UK aircraft industry has been subsidized too much; there are very few modern tariffs higher than 15 percent. Domestic production of the TSR-2, which would have cost $15.4 million each, or more than twice that of the F-111, would have reflected a tariff of more than 100 percent.**

Even with this advanced view of the situation, the report concludes that cooperation with the United States is ruled out for the following reasons:

- The United States has no need for cooperation since the U. S. aircraft industry would be able to meet all requirements.

- The United States is not likely to even buy UK aircraft as a *quid pro quo* for UK purchases.

If this type of reasoning were applied to all industries and companies the conclusions would be disastrous for the United Kingdom. Neither o

these conclusions reflect the recognition for competition as a social need —competition with the best, not with the second best, to improve the potential of any industry. Even the second conclusion on the UK likelihood of U. S. buying UK aircraft does not reflect the desire to ask for competition with the United States, but merely says there will not be enough *quid pro quo* allocation of the market.

What do we do about this situation and where do we go from here? I do not profess to know all the answers and the Government has not adopted a specific solution or has not identified any specific remedy to the problem. We have too much at stake in terms of our military export relations to world affairs to stick our head in the sand like an ostrich and, to use an old cliche, we know we must adopt a position of enlightened self-interest.

First, we have centered our concept on a competitive economy system similar to our own and similar to the concept inherent in any common defense market. Such a system would strive for the development of international relations between ourselves and certainly with nations who have placed such extensive dependence on American industry based on these principles:

- The development of an efficient, lowest possible cost, highest possible quality defense industry.
- Minimum barriers to the free flow of capital, technology, skills and products for the defense industries within the free world.
- Development of an effective specialization with the result that the defense producers in each country apply themselves to those areas of fabrication in which they have the greatest capable efficiency.
- Exploitation of the "economy of scale"—first on a selective basis and then in broader ways.
- Development of a network of industry-to-industry relationships and technical associations.

Secondly, we believe the job of Government is to try to maintain the proper policy environment for such competition by industry; to move ahead in specific selective projects with industry in the next few years to test out the operating principles. A common defense market after all in its purest form probably does not exist anywhere in the world. A common defense market in practical living form, however, is the process of striving to increase the flow of technology, capital, labor and production across borders with minimum interference for the specific purpose of improving the product returned for the effort expended.

Such action will tend to support the most efficient producers and not support all of the independently subsidized producers in separate countries. It will not be surprising, therefore, to see some allied industries, barely maintaining themselves on a highly subsidized basis, opposed to the idea of a common defense market. I do not think these people are to be criticized for we, too, from time to time as this matter develops will have to consider carefully the necessary position of our own industries.

However, on balance it is my opinion, derived through extensive discussions with U. S. manufacturers, that the highly competitive approach that has been taken here in the United States, particularly as a result of Secretary McNamara's cost reduction program, places the U. S. industries in fit condition for competition throughout the world. The large buying of defense production by our allies in the United States has proved this point. In spite of what one may hear from time to time, this buying has been the result, not of super salesmen, but of an increasing number of super buyers throughout the world. Governments have increasingly insisted on purchasing defense materials at the lowest possible cost and, thereby, saving literally billions of dollars for their taxpayers.

With these kinds of defense objectives in mind, we are prepared to proceed pragmatically on the defense common market with these super buyers. In examining our actions and policies, we have made it clear that no policy adopted by us will have support or foreign credence unless it is rooted in our own self interest. We have also recognized that self interest does not require that it be solely profitable to this country and be a one-way street. In fact, our very successful defense export programs will be increasingly counter productive without the acceptance of the same concept of free flow of trade which dominates international commercial markets. The common defense market idea is simply a recognition of this fact and proposes an enlightened method of its implementation. In the specific case of the United Kingdom we have recently agreed to consider the procurement of British equipment for U. S. defense forces in an amount of about $300 million. Such procurement, however, will be carried out in competition with U. S. sources so that the United States will buy from the United Kingdom only when the UK item is competitive in cost and quality.

Thus, in this way DOD believes it is in the interest of the free world to develop a gradual case-by-case pattern of a defense common market. Looking at a long-range aspect, I see no reason to change my earlier estimates which were:

- First, in the next 10 years I expect that our allies may purchase a minimum of $10 to $15 billion of their requirements from the United States by sheer virtue of the fact that defense common market principles will be operative among the leading purchasing defense ministries whether we have a formal market or not.
- Second, I expect in the next 10 years that some $5-$10 billion of combined U. S. and allied requirements may be handled through international production and development programs. While this amount is small compared to the $200 billion which the United States will be spending during that period, or the total of $100 billion spent by other free world countries, it is an amount which will be the largest total of common production and development that has ever occurred in the history of the world.
- Third, proceeding in these practical ways to resolve our problems, we and our allies will place in position for the 1980's a new breed of industry engineer-diplomat practiced in the tasks of using the defense common market approach to harmonize allied military requirements and production to an extent not ever seen before in the field of vehicles, armor, missiles, aircraft and electronics.

I hope this information will be helpful and that industry will find many more ways and means than I have described to participate in world affairs through military exports.

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AUGUST 1966

SPEAKERS CALENDAR

DEPARTMENT OF DEFENSE

Adm. Alfred G. Ward, USN, U. S. Representative to NATO Standing Group and Military Committee, at Independence Day Celebration, Birmingham, Ala., July 4.

DEPARTMENT OF THE ARMY

Gen. Harold K. Johnson, Army Chief of Staff, at Jaycee Prayer Breakfast, Detroit, Mich., June 29.

Gen. Frank S. Besson, Jr., Commanding General, Army Materiel Command, at ceremony marking production of first XM551 General Sheridan Vehicle, Army Tank Automotive Plant, Cleveland, Ohio, June 29.

Maj. Gen. W. J. Sutton, Chief, Army Reserve, at Reserve Officers Assn. National Convention, New York City, June 29.

Maj. Gen. B. F. Taylor, Director of Army Budget, Office of the Comptroller of the Army, at Army Comptrollership School, Syracuse University, June 29.

Lt. Gen. Robert Hackett, Comptroller of the Army, at Army Comptrollership School, Syracuse University, July 1.

Brig. Gen. Andrew P. Rollins, Asst. to the Chief of Engineers for NASA Support, at Society of Professional Engineers meeting, Corpus Christi, Tex., July 1.

William P. Durkee, Director of Civil Defense, at Governors' Conference, Los Angeles, Calif., July 4–7.

Brig. Gen. Harry G. Woodbury, Dep. Dir. of Civil Works, Office, Chief of Engineers, at Southern Water Resources Conference, Houston, Tex., July 18.

DEPARTMENT OF THE NAVY

RAdm. E. E. Christensen, Dep. Commander for Plans and Program, Air Systems Command, at Design for Maintainability Conference, Statler Hilton Hotel, New York, N. Y.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. M. C. Demler, Commander, Research & Technology Div., Air Force Systems Command, at Space & Ballistic Missile Technical Symposium, Air Force Academy, Colo., July 6–8.

Maj. Gen. B. I. Funk, Commander, Ballistic Systems Div., Air Force Systems Command, at Space & Ballistic Missile Technical Symposium, Air Force Academy, Colo., July 6–8; at British United Services meeting, Los Angeles, Calif., July 15.

Gen. B. A. Schriever, Commander, Air Force Systems Command, at Tennessee Space Institute, Arnold Air Force Station, Tenn., July 11.

Maj. Gen. J. J. Cody, Dep. Chief of Staff, Systems, Air Force Systems Command, at Society of American Military Engineers, Vandenberg AFB, Calif., July 19; at Photo-Optical Engineers Institute, St. Louis, Mo., Aug. 22.

Lt. Gen. W. A. Davis, Vice Commander, Air Force Systems Command, at Atlantic Research Conference, Costa Mesa, Calif., July 29.

Maj. Gen. H. J. Sands, Jr., Commander, Ballistics Systems Div., Air Force Systems Command, at Altantic Research Conference, Costa Mesa, Calif., July 29.

Gen. H. M. Estes, Jr., Commander, Military Airlift Command, at National Defense Transportation Assn. meeting, Atlanta, Ga., Aug. 11.

Main Battle Tank Program Enters New Phase

The joint United States/Federal Republic of German (FRG) Main Battle Tank program will enter a new phase with the building of pilot models and testing. The management of this phase will shift from the Keller & Knappich plant in Augsburg, Germany, to the General Motors Technical Center, Warren, Mich. U. S. prototypes will be built at the Army Tank Plant in Cleveland, Ohio, and an equal number of FRG prototypes will be built in Germany.

Start of the new phase marks a milestone achieved in the unique two-nation tank development program, which was initiated under an agreement between officials of the United States and Germany in August 1963.

The agreement created an international two-man Program Management Board to execute a joint effort to design a single tank, producible in either country. Major General W. G. Dolvin, USA, was appointed the U. S. member and Dr. Fritz Englemann, the German member.

The board is now preparing plans for advance production engineering of the final model. All costs are shared on a fifty-fifty basis.

To assist in executing the agreement, the Program Management Board first retained the services of Lockheed Missile & Space Co. to run a Parametric Design/ Cost Effectiveness Study and created a Joint Engineering Agency (JEA) composed of Government personnel to break out and then review design tasks, guided by input from the Lockheed study.

Concurrently, each nation selected a civilian industrial firm as its engineering assistance contractor. The United States selected the General Motors Corp.; the FRG, the German Development Corp. Personnel from these contractors composed a joint design team.

Working closely together in this organizational frame, American and German experts have overcome linguistic and technical differences in reaching agreement on "one" tank as called for in the basic agreement. Not only has a mutually agreeable design been established but remaining development workloads have been defined and assigned to the nation responsible for execution.

The United States, for example, will furnish a new high horsepower multi-fueled engine; incorporate its Shillelagh missile system into a newly designed Primary Armament System; and submit a new type suspension system for final selection by the Program Management Board.

The Federal Republic of Germany will furnish a uniquely designed transmission capable of handling the horsepower output promised by the American engine; will continue development of a more conventional high horsepower engine as a backup; and will submit a new type suspension system also for final selection by the Program Management Board.

Since the new Main Battle Tank for the 1970's will be expected to fight and survive on a nuclear battle field, many details concerning the project remain classified. But no single task now appears to be unsolvable with the result that progress of the US/FRG cooperative tank development program is forging ahead.

With its success, increased interest from other NATO nations is expected. The Program Management Board has briefed many friendly nations to date and expects the benefits of cooperative development will be shared by others beside the United States and Germany.

NOTES FOR EDITORS

Briefed below are some events and projects within the Department of Defense which may be of interest to writers and editors. If further information on any of these topics is desired, please write to Chief, Magazine and Book Branch, Office of Assistant Secretary of Defense (Public Affairs), Washington, D.C., 20301

NAVY STUDIES HOMING PIGEONS FOR HINTS ON NAVIGATION

Navy scientists are taking an increased interest in the uncanny ability of homing pigeons to find their way back to their nests over unfamiliar terrain.

Knowledge gained from experiments now being conducted with the birds could lead to new concepts in miniature navigation and detection systems.

To study the phenomenon, the Navy is tracking the birds with a miniature radio beacon transmitter strapped to the pigeon's back. In tracking the pigeon, two receiving stations are set up at different locations along the bird's probable flight path. When the instrumented bird is released, the two stations begin to record information on the bird's flight behavior.

The transmitter, which weighs less than two ounces including power supply, has an output of one thousandth of a watt.

It is hoped that investigations will provide information which will enable scientists to clarify various hypotheses concerning those factors affecting the homing instinct.

NAVY TESTS FLIGHT DECK COATING

The U.S. Navy is testing a new flight deck surfacing compound on its aircraft carriers called poly urethane. Tests show that the new product lasts three to four times longer than surfacing now in use. Because poly urethane bonds well with wood and steel, the Navy hopes to use the compound as a preservative of the wood on anti-submarine aircraft carrier flight decks. Crushed quartz sand added to the compound makes it an affective non-skid surface.

NEW OIL ANALYSIS SYSTEM NO LONGER REQUIRES LABORATORY FACILITIES

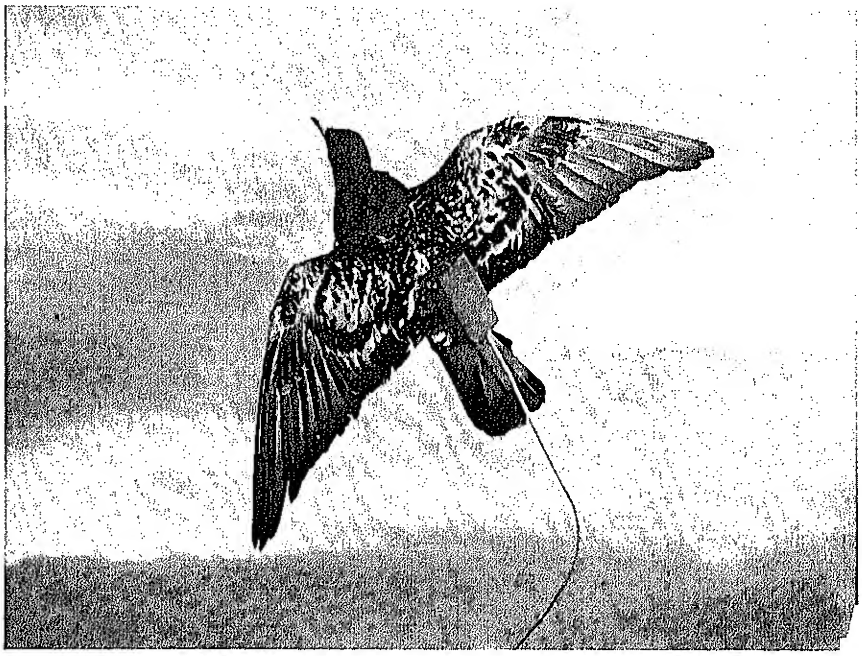
Engine oil analysis to detect aircraft engine wear is about to come out of the laboratory and move into the maintenance hangar. Using a small analyzer now under development, the Air Force will be able to detect the amount of submicroscopic metal particles in oil which indicate aircraft engine wear without the controlled laboratory conditions that are now necessary.

The technique of analyzing engine oil to measure wear is not new, but its application to gas turbine engines is comparatively recent. With the new analyzer, engine oil samples extracted periodically from engine oil systems are examined for metallic contamination by spectrometric analysis. In this technique, the oil specimen is vaporized by heat, and its light output separated by wave lengths. Spectral light then passes through exit slots positioned in the focal curve to obtain wave lengths of the various metals in the oil sample. Different metals show up in different colors in the spectrum.

NAVY ADOPTS NEW STEREOSCOPIC SYSTEM IN UNDERWATER EXPLORATION

Navy oceanographers are now using a cable-lowered information gathering stereoscopic system which includes twin cameras for taking stereo photos, a coring device, current velocities and direction recording instruments, sediment samplers, water samplers and a temperature profiler, in their studies of the sea.

Watertight cases enclose the cameras and power supply which, with the system instrumentation, are mounted in a skid-like frame. The complete unit weighs less than 500 pounds in sea water and is pressure resistant to depths of over 36,000 feet. Special tripping mechanisms and a preset programming device operate the cameras, strobe lights and other equipment in proper sequence. A sonar transducer mounted on the frame is used to position the system at any specified target height from the bottom.



To study the homing ability of pigeons, the Navy has developed a miniatu transmitting system which is strapped to the bird's back during flight. T instrument records changes in the environment as well as the bird's physiolo cal reactions. Attached as shown in the model, the tracking transmitter cou be helpful in answering the question of how homing pigeons are able navigate.

CALENDAR OF EVENTS

July 5–9: American College Public Relations Assn. Meeting, Boston, Mass.
July 11–15: National Conference of Weights & Measures, Denver, Colo.
July 16–19: National Audio-Visual Assn. Meeting, Washington, D.C.
July 19–23: National Tool, Die and Precision Machining Assn. Meeting, Hot Springs, Va.
Aug. 7–12: Professional Photographers of America Meeting, Chicago, Ill.
Aug. 8–11: Society of Automotive Engineers Meeting, Los Angeles, Calif.
Aug. 17–19: Joint Automatic Control Conference, Seattle, Wash.
Aug. 19–26: VFW National Convention, New York City.
Aug. 22–Sept. 10: Science Congress, Tokyo, Japan.
Aug. 26–Sept. 1: American Legion National Convention, Washington, D.C.
Sept. 11–16: American Chemical Society Meeting, New York City.
Sept. 18–21: American Institute of Chemical Engineers Meeting, Atlantic City, N.J.
Sept. 18–22: American Society for Industrial Security Meeting, Philadelphia, Pa.
Sept. 21: International Atomic Energy Agency Meeting, Vienna, Austria.
Sept. 27–30: American Roentgen Ray Society Meeting, San Francisco, Calif.
Oct. 3–5: Aerospace & Electronic Systems Convention, Washington, D.C.
Oct. 4–6: American Oil Chemists Society Meeting, Philadelphia, Pa.
Oct. 5–7: International Association of Electrical League, Scottsdale, Ariz.
Oct. 6: NSIA Maintenance Advisory and Procurement Advisory Committee Meetings, Washington, D.C.
Oct. 7: Society of American Military Engineers Meeting, St. Paul, Minn.
Oct. 9–12: National Defense Transportation Assn. Meeting, Dallas, Tex.
Oct. 9–14: Electrochemical Society Meeting, Philadelphia, Pa.
Oct. 10–12: Assn. of the U.S. Army Meeting, Washington, D.C.
Oct. 17–21: American Society of Civil Engineers Meeting, Philadelphia, Pa.
Oct. 18–20: American Society of Mechanical Engineers Meeting, Minneapolis, Minn.
Oct. 19–21: Institute of Electric & Electronic Engineers Meeting, Boston, Mass.
Oct. 26–29: Second International Congress on Air Technology, Hot Springs, Ark.
Oct. 31–Nov. 2: Defense Supply Assn. Meeting, Philadelphia, Pa.

USAF Selects Contractor To Develop Research Vehicle for Project PILOT

The U. S. Air Force has selected the Martin Co. to develop a manned, lifting body vehicle—a revolutionary rocket plane without wings—to explore the atmospheric maneuverability of future spacecraft.

The new research vehicle, designated the SV-5P, will be built for the Air Force Systems Command's Aeronautical Systems Division as part of the PILOT (Piloted Low Speed Test) Project.

Powered by a rocket engine, it will carry one man and be used to learn more about the flight characteristics and maneuverability of wingless lifting bodies from supersonic speeds of approximately mach 2 (more than 1,000 miles an hour) down to landing at normal jet-fighter speeds of between 120 and 150 miles an hour.

Initially, the SV-5P will be carried aloft under the wing of a B-52 aircraft and will be dropped for powerless, gliding flights landing at Edwards AFB, Calif. In later powered tests, the lifting body will be dropped from the B-52 and then will rocket to Mach 2 speed at about 100,000 feet altitude from where it will maneuver to a landing at Edwards.

The SV-5 shape looks like a bulbous wedge, curving on the top, flat on the bottom with angled vertical fins. The aerodynamic shape of this research aircraft is the result of many hours of wind tunnel testing and aerodynamics analysis by Martin and the Air Force over the past seven years.

The PILOT Project is part of the Air Force's Spacecraft Technology and Advanced Reentry Test (START) Program. Also in the overall program is an unmanned version of the SV-5 which will be boosted to orbital altitude and hypersonic speed from where it will perform maneuvering reentry through the earth's atmosphere to a recovery initiation at approximately Mach 2.

Flight testing of the manned SV-5P will be conducted by a joint Air Force-NASA test team at Edwards AFB.

USAF Electronics Briefing for Industry Postponed

The Air Force has postponed the classified advanced planning briefing for industry on electronic systems which was scheduled to be held in Boston, Mass., June 28-30 (*Defense Industry Bulletin*, May 1966, page 10).

The briefing, sponsored by the Air Force Systems Command's Electronic Systems Division and the National Security Industrial Association, is now being planned for the fall on a date to be announced.

Postponement action was in accord with Air Force policy to assure full support for operations in Southeast Asia by canceling or postponing certain activities not absolutely essential and related to operational requirements.

Lift-Cruise Engine Contracts Awarded

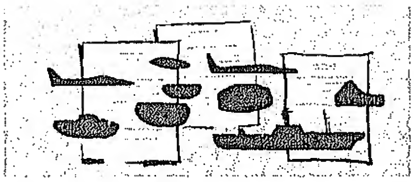
The U. S. Air Force has awarded contracts totaling $41,750,000 to three engine manufacturers for development of a vectored-thrust cruise propulsion system (lift-cruise engine).

The three contractors are General Electric, Evendale, Ohio; Pratt & Whitney, East Hartford, Conn.; and the Wright Aeronautical Division, Curtiss-Wright Corp., Wood-Ridge, N. J. The companies will perform their work under contract to the Aero Propulsion Laboratory (APL) of the Air Force Systems Command's Research and Technology Division.

In Phase I of the program each company will build a lift-cruise engine to demonstrate engineering technology. In Phase II one or more contractors will be selected to build a lift-cruise engine to size and for a specific application. The Air Force expects the program to advance the engine thrust-to-weight ratio considerably. Present engines develop a thrust-to-weight ratio of about four to one.

The program is managed by Major E. A. Johnson of APL's Turbine Engine Division. Ralph L. Apel is the Air Force project engineer.

The lift-cruise engine developed under this program will be applicable to V/STOL and other aircraft systems. Contractors were given the go-ahead on the 15-month program Jan. 1, 1966.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of May 1966:

DEFENSE SUPPLY AGENCY

2—U.S. Bedding Co., St. Paul, Minn. $1,933,-680. 70,000 steel bunk beds and 150,000 adapters. St. Paul. Defense General Supply Center, Richmond, Va.

—Cesco Container Mfg. Corp., Northampton, Mass. $1,128,416. 92,645 plywood locker trunks. Northampton. Defense Personnel Support Center, Philadelphia.

4—Oscar Mayer & Co., Madison, Wis. $1,-153,820. 499,968 cans of pre-fried sliced bacon. Madison. Defense Personnel Support Center, Philadelphia.

—Kayser Roth Corp., Colonial Div., Woodbury, Tenn. $1,550,060. 807,744 men's blue chambray shirts. Woodbury. Defense Personnel Support Center, Philadelphia.

—Riegel Textile Corp., New York City. $5,-376,600. 8,461,251 yards of cotton sateen cloth. New York City. Defense Personnel Support Center, Philadelphia.

—B. G. Colton, New York City. $1,615,925. 976,272 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelpia.

—Putnam Mills, New York City. $2,206,616. 2,389,130 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

6—Dowling Bag Co., Valdosta, Ga. $1,366,000. Six million sandbags. Defense General Supply Center, Richmond, Va.

—Cavalier Bag Co., Lumberton, N.C. $1,-675,804. Seven million sandbags. Defense General Supply Center, Richmond, Va.

9—Smith, Kline & French Laboratories, Philadelphia. $1,129,167. 78,360 bottles of chlorpheniramine maleate, phenylpropanolamine hydrocheloride and isopropamide iodine capsules. Defense Personnel Support Center, Philadelphia.

11—Pettibone Mulliken Corp., Washington, D.C. $1,440,200. 76 diesel fork lift trucks. Defense General Supply Center, Richmond, Va.

—Oscar Mayer & Co., Madison, Wis. $1,315,-131. 3,570,816 five and one-half-ounce cans of sliced pork. Defense Personnel Support Center, Philadelphia.

—Oscar Mayer & Co., Madison, Wis. $1,313,-346. 3,570,816 five and one-half-ounce cans of sliced ham. Defense Personnel Support Center, Philadelphia.

12—West Point-Pepperell, Inc., New York City. $1,219,045. 1,210,170 linear yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Mt. Vernon Mills, Baltimore, Md. $1,237,-486. 1,239,130 linear yards of cotton duck cloth. Baltimore. Defense Personnel Support Center, Philadelphia.

—Prestex, Inc., New York City. $1,936,781. 1,607,480 linear yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia.

13—Burlington Industries, Pacific Mills Div., New York City. $3,669,450. 1,480,000 linear yards of polyester fiber and wool tropical cloth. Defense Personnel Support Center, Philadelphia.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for grade 115/145 aviation gas:

Humble Oil & Refining Co., Houston, Tex. $11,021,829. 77,335,000 gals.

Socony Mobil Oil Co., New York City. $10,881,413. 78,550,000 gals.

Richfield Oil Corp., Los Angeles. $9,896,-369. 65,100,000 gals.

Cities Service Oil Co., New York City. $7,880,854. 58,800,000 gals.

Tidewater Oil Co., New York City. $6,-338,836. 46,032,000 gals.

Standard Oil Co. of Calif., San Francisco. $5,846,127. 40,278,000 gals.

Standard Oil Co., Louisville, Ky. $5,783,-682. 43,034,926 gals.

American Oil Co., Chicago. $4,691,432. 31,231,000 gals.

Phillips Petroleum Co., Bartlesville, Okla. $4,521,001. 34,240,000 gals.

Sinclair Refining Co., New York City. $3,333,960. 25,200,000 gals.

Continental Oil Co., Houston, Tex. $2,-094,033. 15,852,500 gals.

Union Oil Co. of Calif., Los Angeles. $1,760,608. 11,608,000 gals.

Shamrock Oil & Gas Corp., Amarillo, Tex. $1,391,003. 10,560,000 gals.

LaGloria Oil & Gas Co., Houston, Tex. $1,198,751. 8,772,000 gals.

Tidewater Oil Co., Los Angeles. $1,167,-264. 7,560,000 gals.

16—Bruce Products, Inc., Eatontown, N.J. $2,364,000. 200,000 men's lightweight taupe raincoats. Eatontown. Defense Personnel Support Center, Philadelphia.

—Laura Industries, Inc., Selma, Ala. $1,-253,745. 109,100 men's lightweight taupe raincoats. Selma. Defense Personnel Support Center, Philadelphia.

17—Rachelle Laboratories, Long Beach, Calif. $1,330,094. 757,440 bottles (100 tablets each) of tetracycline hydrochloride. Long Beach. Defense Personnel Support Center, Philadelphia.

—Pacific Mills, division of Burlington Industries, New York City. $1,800,000. 400,000 yards of wool serge cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Hanora Fabrics Co., New York City. $1,-595,750. 350,000 yards of wool serge cloth. New York City. Defense Personnel Support Center, Philadelphia.

—J. P. Stevens & Co., New York City. $3,-516,000. 800,000 yards of wool serge cloth. New York City. Defense Personnel Support Center, Philadelphia.

—American Oil Co., Chicago. $2,199,061. Fuel oil and gasoline. Chicago. Defense Fuel Supply Center, Alexandria, Va.

—Socony Mobil Oil Co., New York City. $1,-464,196. Fuel oil and gasoline. Defense Fuel Supply Center, Alexandria, Va.

—Texaco, Inc., New York City. $1,131,725. Fuel oil and gasoline. New York City. Defense Fuel Supply Center, Alexandria, Va.

18—Etowah Industries, Etowah, Tenn. $1,-419,000. 300,000 men's wind resistant cotton coats. Etowah. Defense Personnel Support Center, Philadelphia.

—Kings Point Industries, Inc., New York City. $1,048,000. 200,000 men's wind resistant cotton coats. New York City. Defense Personnel Support Center, Philadelphia.

19—Rachman Mfg. Co., Reading, Pa. $3,944,-950. 400,000 field type insect bars. Reading. Defense Personnel Support Center, Philadelphia.

—Regal Textile Corp., New York City. $1,-244,029. 1,460,000 yards of fire resistant cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

20—Tucker Mfg. Co., Montgomery, Ala. $1,-699,428. 1,630,776 solid wood tent poles. Montgomery. Defense Personnel Support Center, Philadelphia.

—Land O'Lakes Creameries, Inc., Minneapolis, Minn. $1,366,094. 2,739,312 pounds of dehydrated ice cream mix. Minneapolis. Defense Personnel Support Center, Philadelphia.

23—The Defense Fuel Supply Center, Alexandria, Va. has awarded the following contracts for petroleum:

Texaco Export, Inc., New York City. $9,984,000. 4,800,000 barrels, Navy Special.

Richfield Oil Corp., Los Angeles. $3,-960,080. 300,000 barrels fuel oil.

Asiatic Petroleum Corp., New York City. $2,728,000. 1,600,000 barrels, Navy Special.

Union Oil Co. of Calif., San Francisco. $1,970,800. 100,000 barrels gasoline, combat Type 1; 600,000 barrels Navy Special.

Union Oil Co. of Calif., Los Angeles. $2,088,100. 100,000 barrels fuel oil, diesel marine; 644,000 barrels Navy Special; 100,000 barrels No. 6 fuel oil.

Continental Oil Co., Houston, Tex. $1,-644,600. 460,000 barrels fuel oil, diesel marine.

Socony Mobil Oil, New York City. $1,-023,120. 368,000 barrels Navy Special, 100,000 barrels No. 6 fuel oil.

—H. I. Garment, Chicago. $1,117,756. 112,112 wet-weather, coated nylon overalls. Chicago. Defense Personnel Support Center, Philadelphia.

—Addison Shoe Corp., Wynne, Ark. $1,737,-998. 167,133 mildew resistant safety shoes. Wynne. Defense Personnel Support Center, Philadelphia.

24—Choctaw Mfg. Co., Silas, Ala. $1,291,436. 524,976 men's white trousers. Silas. Defense Personnel Support Center, Philadelphia.

25—Prestex, Inc., New York City. $3,363,236. 4,200,00 yards of cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Riegel Textile Corp., New York City. $1,-209,946. 1,401,000 yards of cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Glen Berry Mfg., Inc., Commerce, Okla. $1,814,777. 1,195,000 cotton sateen trousers. Commerce. Defense Personnel Support Center, Philadelphia.

—Orthopedic Equipment Co., Bourbon, Ind. $2,076,783. 98,286 folding litters. $2,334,-723. 225,816 tent poles. Bourbon. Defense Personnel Support Center, Philadelphia.

26—Alpha Industries, Knoxville, Tenn. $1,503,-920. 170,900 men's cotton sateen jackets. Knoxville. Defense Personnel Support Center, Philadelphia.

—Magline, Inc., Pinconning, Mich. $2,146,-823. 5,146 tent frame sections. Pinconning. Defense Personnel Support Center, Philadelphia.

—B. F. Goodrich, Watertown, Mass. $1,001,-322. 52,980 pairs of black cold-weather insulated boots. Watertown. Defense Personnel Support Center, Philadelphia.

—Edgington Oil Refineries, Long Beach, Calif. $1,185,800. 484,000 barrels of fuel oil. Defense Fuel Supply Center, Alexandria, Va.

27—Warren Co., Atlanta, Ga. $1,030,360. 1,624, sixty-five cubic feet, refrigerators. Atlanta. Defense General Supply Center, Richmond, Va.

—Medart Products, Inc., St. Louis. $1,580,-333. 118,721 steel clothing lockers. St. Louis. Defense General Supply Center, Richmond, Va.

31—U.S. Steel Corp., Washington, D.C. $1,-141,346. 11,904,431 pounds of zinc coated, corrugated steel sheets. Washington, D.C. Defense Industrial Supply Center, Philadelphia.

—The following six contracts for petroleum products have been awarded by the Defense Fuel Supply Center, Alexandria, Va:

Hess Oil & Chemical Corp., Perth Amboy, N.J. $1,076,250. 300,000 barrels diesel marine fuel oil.

American Oil Co., Chicago. $4,192,831. 850,000 barrels of gasoline.

Shell Oil, New York City. $3,605,220. 780,000 barrels of combat gas, Type I.

Cities Service Oil Co., New York City. $1,550,522. 16,800,000 gallons of JP-4 jet fuel.

Sun Oil Co., Philadelphia. $2,202,000. 600,000 barrels of diesel fuel oil.

Hess Oil & Chemical Corp., Perth Amboy, N.J. $1,577,625. 850,000 barrels of diesel fuel oil and 50,000 barrels of kerosene.

Contract Legend

Contract information is listed in the following sequence: Date — Company — Value — Material or Work to be Performed — Location Work Performed—Contracting Agency.

ARMY

2—G.E.O. Systems, Melbourne, Fla. $1,148,694. Work on the Solar Vacuum Telescope. Sun Spot, N.M. Engineer Dist., Albuquerque, N.M.

—Dorr-Oliver, Inc., Bartow, Fla. $1,169,851. Gates and locks for the Arkansas River Navigation Project. Tampa, Fla. Engineer Dist., Little Rock, Ark.

—Blount Construction Co., Montgomery, Ala. $3,237,611. Work on the Columbia Lock and Dam. Caldwell County, La. Engineer Dist., Vicksburg, Miss.

—Eugene Luhr & Co., Columbia, Ill. $1,304,913. Work on the Village of New Athens, Kaskaskia River, Illinois Project. New Athens, Ill. Engineer Dist., St. Louis.

—Cabot Corp., Pampa, Tex. $1,069,265. 90mm gun tube forgings. Kingsmill, Tex. Watervliet Arsenal, N.Y.

—United Aircraft, Stratford, Conn. $7,010,000. CH-54 helicopters. Stratford. Army Aviation Materiel Command, St. Louis.

—University of Wisconsin, Madison, Wis. $1,260,000. Operation of the Mathematics Research Center at the University of Wisconsin. Army Research Office, Durham, N.C.

—United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $6,936,105. CH-54 aircraft engines. East Hartford. Army Aviation Materiel Command, St. Louis.

—Chaney & Hope, Inc., Addison, Tex. $1,048,400. Construction of nitric acid processing units. Kingsport, Tenn. Engineer Dist., Mobile, Ala.

—Albion Malleable Iron Co., Albion, Mich. $1,251,162. Heads and metal parts for the 2.75" rocket. Albion. Ammunition Procurement & Supply Agency, Joliet, Ill.

3—Southwest Factories, Inc., Eidel International Div., Albuquerque, N.M. $4,724,428. Mobile laundry units. Albuquerque. Army Mobility Equipment Center, St. Louis.

—Lockley Machine Co., New Castle, Pa. $3,681,848. Demolition kits and spare parts. New Castle. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Air Research Mfg. Co., Phoenix, Ariz. $4,999,738. Gas turbine engines and utility sets. Phoenix. Army Medical Research & Development Command, Office of the Surgeon General, Washington, D.C.

—AVCO Corp., Stratford, Conn. $2,000,000. Modification of the T55–L–7 turbine engine. Stratford. Army Aviation Materiel Command, St. Louis.

4—Olin-Mathieson Chemical Corp., East Alton, Ill. $4,412,698. 7.62mm ammunition. East Alton. Frankford Arsenal, Philadelphia.

—Remington Arms Co., Bridgeport, Conn. $4,146,760. 7.62mm ammunition. Bridgeport. Frankford Arsenal, Philadelphia.

—Arundel Corp., Baltimore, Md. $1,962,874. Dredging in the Delaware River. New Castle County, Del. Engineer Dist., Philadelphia.

—Bendix Corp., Baltimore, Md. $9,386,664. Fuzes. Towson, Md. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Harvey Aluminum, Inc., Torrance, Calif. $1,554,168. 40mm ammunition cases. Torrance. Ammunition Procurement & Supply Agency, Joliet, Ill.

—R. G. LeTourneau, Inc., Longview, Tex. $5,125,420. 750-pound bombs. Longview. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Raytheon Co., Lexington, Mass. $7,582,080. Metal parts for 750-pound bombs. Bristol, Ten. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Eureka Williams Co., Bloomington, Ill. $1,510,620. Bomb fuzes. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Bendix Corp., Baltimroe, Md. $4,500,720. Bomb fuzes. Baltimore. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Bell Helicopter Co., Fort Worth, Tex. $1,209,496. Hub assemblies for HU–I helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.

—American Machine & Foundry Co., Brooklyn. N.Y. $5,127,106. 750-pound bombs. Brooklyn. Ammunition Procurement & Supply Agency, Joliet, Ill.

5—Chamberlain Corp., Waterloo, Iowa. $3,115,000. Rehabilitation of the Army Ammunition Plant, Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—U.S. Time Corp., Waterbury, Conn. $3,526,631. Tooling and special test equipment for artillery fuze production. Waterbury. Ammunition Procurement & Supply Agency, Joliet, Ill.

6—Rexarc, Inc., West Alexandria, Ohio. $1,109,151. Acetylene generating and charging plants, trailer mounted. West Alexandria. Army Mobility Equipment Center, St. Louis.

—R. G. LeTourneau, Inc., Longview, Tex. $1,075,000. 750-pound bomb assemblies, Longview. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $2,450,000. Bomb fuzes and metal parts. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Norris Thermador Corp., Hesse-Eastern Div., Everett, Mass. $1,437,663. Bomb unit tube assemblies. Everett. Ammunition Procurement & Supply Agency, Joliet, Ill.

—A. O. Smith Corp., Chicago. $5,393,760. 750-pound bomb metal parts. Waco, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Bulova Watch Co., Jackson Heights, N.Y. $4,150,002. Arming mechanisms for 81mm mortar shells. Jackson Heights. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Lane Construction Corp., Meriden, Conn. $8,103,378. Construction on the Blanchard River Project. Blanchard, Pa. Engineer Dist., Baltimore, Md.

—AVCO Corp., Richmond, Ind. $1,120,545. Metal parts for 750-pound bombs. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.

—AVCO Corp., Richmond, Ind. $1,182,968. Metal parts for 750-pound bombs. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Motors, Allison Div., Indianapolis, $3,176,105. Transmissions and power transfer units. Indianapolis. Army Tank Automotive Center, Warren, Mich.

—AVCO Corp., Richmond, Ind. $1,598,021. 2.75-inch rocket fuzes. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.

—L. T. Industries, Inc., Garland, Tex. $2,057,591. Fin assemblies for 750-pound bombs. Garland. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Raytheon Co., Lexington, Mass. $1,629,417. Metal parts for bombs. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

9—Olin Mathieson Chemical Corp., New York City. $4,244,724. Various propellant charges and miscellaneous ammunition. Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Pettibone-Mulliken Corp., Chicago. $4,335,560. Rough terrain truck fork lifts. Chicago. Army Mobility Equipment Center, St. Louis.

—White Motor Co., Lansing, Mich. $10,003,237. 2½-ton trucks. Lansing. Army Mobility Command, Warren, Mich.

—LTV Aerospace Corp., Warren, Mich. $10,709,569. Advanced production engineering for the LANCE missile system. Warren. Army Missile Command, Huntsville, Ala.

—U.S. Time Corp., Waterbury, Conn. $21,547,830. Artillery shell fuzes. Waterbury; Euclid, Ohio; Bristol, Conn.; Patterson, N.J.; and Thomaston, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Creighton, Ernst and Wallace, Nashville, Tenn. $9,526,000. Rehabilitation of existing TNT production lines. Chattanooga, Tenn. Army Mobile Engineer Dist., Mobile, Ala.

10—Metz Construction Co., Tucson, Ariz. $1,053,403. Construction of troop housing facilities and tactical equipment shops. Donna Ana Range, N.M. Engineer Dist., Albuquerque, N.M.

—Grosshans & Petersen, Inc., Marysville, Kan. $1,153,905. Relocation of Northern Pacific railroad track. Bismarck, N.D. Engineer Dist., Omaha, Neb.

—General Electric, Schenectady, N.Y. $9,068,181. Multi-functional array radar power plant. Baltimore, Md. Engineer Dist., Honolulu, Hawaii.

—Union Carbide Corp., New York City. $5,579,127. Radio batteries. Chemway, N.C. and Red Oak, Iowa. Army Electronics Command, Philadelphia.

—Marathon Battery Co., Wausau, Wis. $1,447,688. Radio batteries. Wausau. Army Electronics Command, Philadelphia.

—Burgess Battery Co., Freeport, Ill. $1,416,780. Radio batteries. Freeport. Army Electronics Command, Philadelphia.

11—B. Jahn Mfg. Co., New Britain, Conn. $1,070,096. Cal. 30 carbine magazine assemblies. New Britain. Springfield Armory, Mass.

—Bowen-McLaughlin-Hork Corp., York, Pa. $1,481,469. Half-ton trucks. York. Army Tank Automotive Center, Warren, Mich.

—Ford Motors, Dearborn, Mich. $1,247,507. Stake and platform trucks. Milpitas, Calif. and Claycomo, Mo. Army Tank Automotive Center, Warren, Mich.

—Vinnel Corp., Alhambra, Calif. $2,275,000. Overhaul and refit of tankers. Beaumont, Tex. Army Mobility Equipment Center, St. Louis.

12—Boeing Co., Vertol Div., Morton, Pa. $2,795,491. Rotary wing assembly for the CH-47 aircraft. Morton. Army Aviation Materiel Command, St. Louis.

—Boeing Co., Vertol Div., Morton, Pa. $1,089,200. Transmission assembly for CH-47 aircraft. Morton. Army Aviation Materiel Command, St. Louis.

—Boeing Co., Vertol Div., Morton, Pa. $1,129,789. Transmission for CH–47 aircraft. Morton. Army Aviation Materiel Command, St. Louis.

—Leadcraft, Inc., Denton, Tex. $2,956,460. Semi-trailers. Brady, Tex. Army Tank Automotive Center, Warren, Mich.

—Bulova Watch Co., Jackson Heights, N.Y. $1,784,708. Rocket fuzes. Jackson Heights. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Chrysler Motors, Detroit. $1,772,394. Cargo trucks. Warren, Mich. Army Tank Automotive Center, Warren, Mich.

13—Fontaine Truck Equipment Co., Birmingham, Ala. $1,793,268. Semi-trailers. Haleyville, Ala. Army Tank Automotive Center, Warren, Mich.

—Norris Thermador Corp., Los Angeles. $1,940,400. 81mm projectiles. Los Angeles. Southwest Procurement Agency, Pasadena, Calif.

—Parsons Mfg. and Stamping Co., Cardova. Tenn. $1,611,617. Rotating disks. Cardova. Ammunition Procurement & Supply Agency, Joliet, Ill.

—American Fabricating Products Co., Indianapolis, Ind. $1,693,589. Cartridge containers. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Electric, Burlington, Vt. $1,204,473. Spare parts for aircraft guns, gun pods and armament pod sets. Burlington. Army Weapons Command, Rock Island, Ill.

—Sanders Associates, Bedford, Mass. $2,983,564. Forward Area Acquisition Radar. Nashua, N.H.; Plainville, N.Y.; and Bedford. Army Missile Command, Huntsville, Ala.

—Remington Arms Co., Bridgeport, Conn. $10,205,407. Various types of ammunition. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—International Harvester Co., Chicago. $1,851,423. Trucks. Bridgeport, Conn. Army Tank Automotive Center, Warren, Mich.

16—Continental Motors, Muskegon, Mich. $2,500,000. 54,683 (½ horsepower, and 3 and 6 horsepower) engines. Muskegon. Army Mobility Equipment Center, St. Louis.

—Colt's Inc., Hartford, Con. $1,160,264. Repair parts for operational support of the M16 and XM16E1 rifle. Hartford. Army Weapons Command, Rock Island Arsenal, Ill.

—Peter Kiewit Sons Co., Vancouver, Wash. $1,177,166. Work on the Granite Lock and Dam, Snake River, Washington Project. Garfield County, Wash. Engineer Dist., Walla Walla, Wash.

—Honeywell, Inc., Hopkins, Minn. $3,142,732. Bomb components. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Amron Corp., Waukesha, Wis. $3,130,135. Bomb components. Waukesha. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Aerojet General Corp., Downey, Calif. $2,025,000. 2.75 inch rockets. Downey. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Hayes International Corp., Birmingham, Ala. $1,323,000. Metal parts for 2.75 inch rockets. Birmingham. Ammunition Procurement & Supply Agency, Joliet, Ill.

—FMC Corp., Santa Clara, Calif. $9,220,000. Metal parts for 4.2 inch projectiles. Santa Clara. Ammunition Procurement & Supply Agency, Joliet, Ill.

—RCA, Camden, N.J. $2,347,146. Radio sets and repair parts. Camden. Army Electronics Command, Philadelphia.

Allis Chalmers Mfg. Co., Milwaukee, Wis. $2,666,948. Generators. Harvey, Ill. Army Mobility Equipment Center, St. Louis.

17 **Westclox, division of General Time Corp.,** La Salle, Ill. $4,574,620. Fuses for artillery ammunition. La Salle. Ammunition Procurement & Supply Agency, Joliet, Ill.

Ingraham Co., Bristol, Conn. $4,612,350. Fuzes for artillery ammunition. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

General Motors, Detroit. $6,048,100. Body and bomb assemblies for 81mm mortar projectiles. Warren, Mich. Ammunition Procurement & Supply Agency, Joliet, Ill.

General Time Corp., Stamford, Conn. $4,746,210. Artillery fuzes. Thomaston, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill.

Chamberlain Corp., Waterloo, Iowa. $1,986,207. Bomb and body assemblies for the 81mm mortar projectile. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill.

American Fabricated Products Co., Indianapolis, Ind. $1,764,560. Fin assemblies for the 81mm mortar. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

Mead-Mount Construction Co., Denver, Colo. $7,285,870. Construction of an academic building at the Air Force Academy, Colorado Springs, Colo. Engineer Dist., Omaha, Neb.

U.S. Rubber Co., Mishawaka, Ind. $1,221,986. 513 sets of collapsible tank assemblies. Mishawaka. Army Mobility Equipment Center, St. Louis.

Allis Chalmers Mfg. Co., Milwaukee, Wis. $2,402,013. 43 tractors with bull dozers. Springfield, Ill. Army Mobility Equipment Center, St. Louis.

J.H. Pomeroy Co., and M-B Contracting Co., San Francisco. $12,600,000. Paving construction of POL and support facilities at Kadena Air Base, Okinawa. Engineer Dist., Ryukyu Islands.

Aerojet-General Corp., Downey, Calif. $1,913,000. Ordnance items. Downey. Edgewood Arsenal, Md.

18 **DeLong Corp.,** New York City. $14,707,741. 14 type A piers (300' by 80') and 13 type B piers (150' by 60'). Japan and Vietnam. Army Mobility Equipment Center, St. Louis.

International Harvester Co., Melrose Park, Ill. $1,068,760. 45 low-speed, full tracked tractors. Chicago. Army Mobility Equipment Center, St. Louis.

Mason & Hanger, Silas Mason & Co., Lexington, Ky. $5,657,600. Loading, assembling and packing of 500 and 750 lb. bombs. Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill.

AVCO Corp., Stratford, Conn. $2,296,700. 966 turbine rotors for UH-1 aircraft. Stratford. Army Aviation Materiel Command, St. Louis.

Boeing Co., Morton, Pa. $5,000,000. Pre-production planning, procurement and production of long lead time materials and items for CH-47 helicopters. Morton. Army Aviation Materiel Command, St. Louis.

Zenith Radio Corp., Chicago. $1,146,360. Bomb fuzes. Chicago. Picatinny Arsenal, Dover, N.J.

General Electric, Burlington, Vt. $9,349,311. 20mm guns and pods for F-4C aircraft. Burlington. Army Weapons Command, Rock Island, Ill.

Patton-Tully Transportation Co., Memphis, Tenn. $1,289,686. Work on the Mississippi River and Tributaries Channel improvement project. Hughes, Ark. and Robinsville, Miss. Engineer Dist., Memphis, Tenn.

T. L. James & Co., Inc., Ruston, La. $1,123,739. Work on the Mississippi River and Tributaries project. Memphis and Dyersburg, Tenn. Engineer Dist., Memphis, Tenn.

19 **Raytheon Co.,** Lexington, Mass. $1,666,516. Design and development of the Hawk missile system. Lexington. Army Missile Command, Huntsville, Ala.

Chrysler Corp., Detroit. $14,124,863. M60-A1E1 turret systems and repair parts. Warren, Mich. Ammunition Procurement & Supply Agency, Joliet, Ill.

Hamilton Watch Co., Lancaster, Pa. $9,216,130. Fuzes for artillery projectiles. Lancaster. Ammunition Procurement & Supply Agency, Joliet, Ill.

Harvey Aluminum, Inc., Torrance, Calif. $2,620,626. 20mm projectiles. Torrance. Frankford Arsenal, Philadelphia.

United Aircraft, Windsor Locks, Conn. $2,895,676. Fuel controls for the T-55 engine. Windsor Locks. Army Aviation Materiel Command, St. Louis.

20 **Sylvania Electric Products Co.,** Mountain View, Calif. $5,500,000. Classified electronics equipment. Mountain View. Army Electronics Command, Fort Monmouth, N.J.

International Harvester Co., Melrose Park, Ill. $5,181,484. 563 four-wheel drive, scoop type loaders. Libertyville, Ill. Army Mobility Equipment Center, St. Louis.

Boeing Co., Morton, Pa. $62,120,000. CH-47A helicopters. Morton. Army Aviation Materiel Command, St. Louis.

IBM, Bethesda, Md. $2,053,036. Design, fabrication, test, delivery, installation and checkout of a complete telemetry data center. White Sands Missile Range, N.M.

Poor & Co., Minneapolis, Minn. $1,442,400. Eight rock crushing and screening plants. Minneapolis. Army Mobility Equipment Center, St. Louis.

Eagle Crusher Co., Galion, Ohio. $1,520,650. 23 rock crushing and screening plants. Galion. Army Mobility Equipment Center, St. Louis.

General Electric, Burlington, Vt. $3,320,000. 504 aircraft machine guns and 100 pods; and for two lots each of repair parts and ancillary equipment. Burlington. Army Weapons Command, Rock Island, Ill.

AVCO Corp., Stratford, Conn. $1,425,000. Facilities to increase production capacity of T-55 engines. Stratford. Army Aviation Materiel Command, St. Louis.

Republic Steel Corp., Youngstown, Ohio. $1,330,000. 3,200,000 square feet of metal ground mats for outdoor storage. Youngstown. Army Mobility Equipment Center, St. Louis.

Colt's Inc., Hartford, Conn. $6,750,000. 5.56mm rifles. Hartford. Army Weapons Command, Rock Island, Ill.

Blount Bros. Corp., Montgomery, Ala. $6,900,000. Rehabilitation of about 500 enlisted men buildings and construction of about 137,000 square feet of new facilities for U.S. Army Training Center, Fort Campbell, Ky. Engineer Dist., Louisville, Ky.

23 **AVCO Corp.,** Stratford, Conn. $2,830,000. T53-L-7 aircraft engines for the OV-1 helicopter. Stratford. Army Aviation Materiel Command, St. Louis.

McDonnell Aircraft, St. Louis. $1,470,000. Engineering development for the Medium Anti-tank/assault Weapon. St. Louis. Army Missile Command, Huntsville, Ala.

Harvey Aluminum, Inc., Torrance, Calif. $3,263,412. 40mm cartridge cases. Torrance. Ammunition Procurement & Supply Agency, Joliet, Ill.

24 **Bulova Watch Co.,** Jackson Heights, N.Y. $4,807,080. Fuzes for artillery ammunition. Jackson Heights. Ammunition Procurement & Supply Agency, Joliet, Ill.

25 **Associated Spring Corp.,** Plymouth, Mich. $1,668,195. 5,800,000 metallic belts for 20mm cartridges. Plymouth. Frankford Arsenal, Philadelphia.

Federal Cartridge Corp., Anoka, Minn. $1,428,077. Bandoleer-packed 5.56mm ball cartridges. Anoka. Frankford Arsenal, Philadelphia.

Massman Construction Co. and Eugene Luhr & Co., Kansas City, Mo. $1,233,292. Work on the Mississippi River and Tributaries Channel Improvement Project. Caruthersville, Mo and Dyersburg, Tenn. Engineer Dist., Memphis, Tenn.

General American Transportation Corp., Chicago. $4,125,000. Railway tank cars. Chicago. Army Mobility Equipment Center, St. Louis.

Holston Defense Corp., Kingsport, Tenn. $6,709,770. Explosives and for operation and maintenance activities at Holston Army Ammunition Plant, Kingsport, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

General Motors, Detroit. $1,325,947. 1,162 engine assemblies with containers, and for 994 transmission assemblies with containers. Flint, Mich. Army Tank Automotive Center, Warren, Mich.

Zero Mfg. Co., Silver Spring, Md. $1,145,400. 46 expandable shelters for self-contained, transportable medical units. Burbank, Calif. Army Medical Research & Development Command, Washington, D.C.

Matanuska Maid, Inc., Anchorage, Alaska. $2,011,174. Dairy products. Anchorage. Purchasing & Contracting Office, Fort Richardson, Alaska.

Progressive Construction Co., Farmersville, Va. $1,417,000. Construction and rehabilitation of Army Training Center buildings and support facilities at Fort Bragg, N.C. Engineer Dist., Savannah, Ga.

26 **FMC Corp.,** San Jose, Calif. $2,003,704. Canister assemblies. San Jose. Picatinny Arsenal, Dover, N.J.

FMC Corp., San Jose, Calif. $1,443,770. Rubber tire wheels for the M113 armored personnel carrier. Charleston, W. Va. Army Tank Automotive Center, Warren, Mich.

Whirlpool Corp., Evansville, Ind. $2,606,737. Canister assemblies. Evansville. Picatinny Arsenal, Dover, N.J.

Collins Radio Co., Richardson, Tex. $10,000,000. 2,650 air-to-ground communications radio sets (AN/ARC-54). Richardson. Army Electronics Command, Fort Monmouth, N.J.

Varo, Inc., Garland, Tex. $3,000,000. Image intensifier assemblies, 25mm, used with STARLIGHT scope and crew served weapon sight. Garland. Army Electronics Command, Fort Monmouth, N.J.

International Telephone & Telegraph Corp., Easton, Pa. $4,000,000. Image intensifier assemblies. Roanoke, Va. Army Electronics Command, Fort Monmouth, N.J.

27 **Hercules, Inc.,** Wilmington, Del. $2,865,341. Miscellaneous propellants and explosives. Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

Robert L. Gayler, Lampasas, Tex. $1,244,363. Data processing conversion and logistical facility depot conversion. Kelly AFB, Tex. Engineer Dist., Fort Worth, Tex.

Pine Bluff Gravel Co., Pine Bluff, Ark. $1,180,248. Work on the Mississippi River and Tributaries (Flood Control) Channel Improvement Project. Washington County, Miss., and Chicot County, Ark. Engineer Dist., Vicksburg, Miss.

American Electronics Laboratory Inc., Lansdale, Pa. $3,000,651. Countermeasure sets. Colmar, Pa. Army Electronics Command, Philadelphia.

General Motors, Indianapolis, Ind. $2,050,637. T-63-A-5A aircraft engines for the OH-6A aircraft. Indianapolis. Army Aviation Materiel Command, St. Louis.

Maremont Corp., Saco, Maine. $5,321,074. M-60 and M-60D machine guns with barrels and bi-pod assemblies. Saco. Army Weapons Command, Rock Island, Ill.

Philco Corp., Philadelphia. $22,686,874. Engineering assistance and installation of an integrated wide-band communication system in Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

Northern Metals Co., Philadelphia. $6,104,331. Stevedoring, terminal handling and vehicle processing services. North Philadelphia. Military Traffic Management and Terminal Service, Brooklyn, N.Y.

AVCO Corp., Stratford, Conn. $30,064,554. T-53-L-11 and T-53-L-13 engines for UH-1 aircraft. $10,063,974. T-55-L-7 engines for CH-47 aircraft. Stratford. Army Aviation Materiel Command, St. Louis.

AVCO Corp., Stratford, Conn. $1,082,000. 2.75-inch rocket fuzes. Richmond, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

KDI Corp., Cincinnati, Ohio. $1,120,144. Fuzes for 2.75-inch rockets. Cincinnati. Ammunition Procurement & Supply Agency, Joliet, Ill.

31 **Raytheon Co.,** Lexington, Mass., has been awarded the following five contracts from the Army Missile Command, Huntsville, Ala.:

- $1,268,383. Engineering model of Reliability Monitoring Equipment for the HAWK missile. Bedford, Mass.
- $1,410,950. Magnetron tubes for the NIKE HERCULES missile system. Waltham, Mass.
- $1,720,707. Engineering services for the self-propelled HAWK missile system. Andover, Mass.
- $3,488,000. Retrofit kits for the HAWK missile system. Andover, Mass.
- $4,768,000. Retrofit kits for the HAWK missile system. Andover, Mass.

Federal Laboratories, Saltsburg, Pa. $1,675,938. Chemicals. Edgewood Arsenal, Md.

Consolidated Diesel Electric Co., division of Condec Corp., Stamford, Conn. $2,728,537. 217 tension tractor truck bodies (less engines, transmissions and axles). Schenectady, N.Y. Army Tank Automotive Center, Warren, Mich.

—General Motors, Indianapolis, Ind. $1,815,-823. Four 1,500 horsepower trains. Indianapolis. Army Tank Automotive Center, Warren, Mich.
—Kentucky Mfg. Co., Louisville, Ky. $1,-127,670. 500 twelve-ton stake semi-trailers. Louisville. Army Tank Automotive Center, Warren, Mich.
—Kaiser Jeep Corp., Toledo, Ohio. $4,270,-458. 3,500 GVW utility trucks. Toledo. Army Tank Automotive Center, Warren, Mich.
—Chrysler Corp., Center Line, Mich. $6,-764,173. Production and inspection engineering services for the M60A tank, M60A1E1 tank, M728 combat engineer vehicle, M60A1 Italian co-production program and for project modification kits. Center Line. Army Tank Automotive Center, Warren, Mich.
—Dorsey Trailer, Inc., Elba, Ala. $1,414,501. 191 twelve-ton semi-trailer vans. Elba. Army Tank Automotive Center, Warren, Mich.
—Fruehauf Corp., Detroit. $2,862,604. 5,000-gallon fuel servicing semi-trailers. Uniontown, Pa. Army Tank Automotive Center, Warren, Mich.
—Mack Truck, Inc., Allentown, Pa. $1,300,-035. Axles for 10-ton military tractor trucks. Allentown. Army Tank Automotive Center, Warren, Mich.
—Dorsey Trailer, Inc., Elba, Ala. $1,789,630. 852 twelve-ton stake semi-trailers. Elba. Army Tank Automotive Center, Warren, Mich.
—AVCO Corp., Cincinnati, Ohio. $1,359,300. AS-1729/VRC fixed-based, vehicle mounted antennae. Cincinnati. Army Electronics Command, Philadelphia.
—Varo, Inc., Garland, Tex. $1,890,698. 650 searchlight sets for use on jeeps, M48 tanks and helicopters. Garland. Army Electronics Command, Fort Monmouth, N.J.
—Collins Radio Co., Cedar Rapids, Iowa. $3,884,904. Radio receiving sets (AN/ARN-82). Cedar Rapids. Army Electronics Command, Fort Monmouth, N.J.
—General Electric, Burlington, Vt. $4,777,-000. XM163 weapons system, repair parts and documentation for self-propelled artillery air defense gun mounted on M113 personnel carriers. Burlington. Army Weapons Command, Rock Island, Ill.
—Philco Corp., Newport Beach, Calif. $2,-685,375. Guidance and control sets, and transmitter alignment test sets for the SHILLELAGH missile system. Newport Beach. Army Missile Command, Huntsville, Ala.
—Philco Corp., Newport Beach, Calif. $6,-415,707. Tooling costs and initial production of CHAPARRAL air defense missile fire units. Newport Beach. Army Missile Command, Huntsville, Ala.
—Cessna Aircraft Co., Wichita, Kan. $1,-186,595. Dispensers (SUU-13/A) for the Air Force. Wichita. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Remington Arms Co., Bridgeport, Conn. $1,195,800. Carton-packed 5.56mm cartridge tracers. Bridgeport. Frankford Arsenal, Philadelphia.
—Eureka Williams Co., Bloomington, Ill. $4,719,264. Fuzes for hand grenades. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Hanson Machinery Co., Tiffin, Ohio. $2,-320,789. 66 five-ton capacity, diesel engine driven cranes. Tiffin. Army Mobility Equipment Center, St. Louis.
—Institute for Defense Analyses, Arlington, Va. $1,165,000. A two months extension of effort for continued research on economic, technical, political and military studies. Arlington. Defense Supply Services, Washington, D.C.
—Global Associates, Oakland, Calif. $5,161,-299. Logistic support at Kwajalein Test Site. NIKE X Project Office, Huntsville, Ala.
—Boeing Co., Morton, Pa. $2,432,762. Acquisition and use of Government facilities to increase CH-47A aircraft production. Morton. Army Aivation Materiel Command, St. Louis.
—Aerojet General Corp., Downey, Calif. $2,-223,311. Dispensers (SUU-14/A) and cartridge ejection assemblies. Downy. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Honeywell, Inc., North Hopkins, Minn. $1,537,443. Dispensers (SUU-13/A) for the Air Force. North Hopkins. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Zenith Radio Corp., Chicago. $2,117,723. Fuzes for the M72 rocket. Chicago. Ammunition Procurement & Supply Agency, Joliet, Ill.
—U.S. Rubber Co., New York City. $9,836,-251. Explosives, and for operation and maintenance activities at the Joliet Ammunition Plant, Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Clark Equipment Co., Benton Harbor, Mich. $5,267,532. Industrial wheeled tractors. Benton Harbor. Army Mobility Equipment Center, St. Louis.
—Western Electric, New York City. $2,052,-570. Additional research and development on the NIKE X system. Santa Monica, Calif. NIKE X Project Office, Huntsville, Ala.
—Jackes-Evans Mfg. Co., St. Louis. $1,126,-995. Links for the 7.62mm cartridge belt. St. Louis. Frankford Arsenal, Philadelphia.
—Universal Match Corp., St. Louis. $1,264,-025. Developments of an Army aircraft turbine engine test and run-in stand. St. Louis. Army Aviation Materiel Command, St. Louis.
—Thiokol Chemical Corp., Bristol, Pa. $5,-078,178. Ordnance items and for operation and maintenance activities at the Longhorn Army Ammunition Plant, Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.
—General Motors, Indianapolis, Ind. $1,-475,116. Product improvement on the T-63-A-5A engine. Indianapolis. Army Aviation Materiel Command, St. Louis.
—Vinnell Corp., Alhambra, Calif. $13,400,-000. Construction of airfield paving and POL facilities at Kung Kuan, Taiwan. Engineer Dist., Okinawa.

NAVY

2—Boeing Co., Vertol Div., Morton, Pa. $3,-611,613. Components outfitting CH/UH-46 helicopters. Morton. Navy Aviation Supply Office, Philadelphia.
3—North American Aviation, Columbus, Ohio. $7,531,000. Conversion of A-5A weapons systems to the RA-5C configuration. Columbus. Bureau of Naval Weapons.
4—Lasko Metal Products, Westchester, Pa. $4,568,140. Low drag bomb-retarding tailfins for Mark 81 bombs. Hughestown, Pa. Naval Ordnance Plant, Louisville, Ky.
—Columbus Milpar & Mfg. Co., Columbus, Ohio. $8,814,246. Low drag bomb-retarding tail fins for Mark 81 bombs. Columbus. Naval Ordnance Plant, Louisville, Ky.
—Sperry Rand Corp., Sperry Gyroscope Div., Great Neck, N.Y. $3,662,041. Terrier missile fire control radar sets. Great Neck. Naval Ordnance Systems Command, Washington, D.C.
—Douglas Aircraft, Long Beach, Calif. $2,-441,000. FY 66 procurement of A-4E and TA-4E aircraft. Long Beach. Naval Air Systems Command, Washington, D.C.
—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $1,358,333. Spare parts used to support B-52 and F-100 aircraft. East Hartford. Naval Aviation Supply Office, Philadelphia.
5—North American Aviation, Rocketdyne Div., McGregor, Tex. $1,840,600. Rocket motors for the Navy and the Air Force. McGregor. Naval Air Systems Command.
—Westinghouse Corp., Sunnyvale, Calif. $1,-198,080. 500 Mark 13 Mod 0 gas generators used to launch Polaris missiles. Sunnyvale. Special Projects Office.
6—Carrier Air Conditioning Co., New York City. $2,528,598. Air-conditioning units and repair parts for installation aboard ship. Syracuse, N.Y. Naval Ship Systems Command.
—Haycox Construction Co., Virginia Beach, Va. $1,119,000. Construction of a 502-man barracks at the Naval Air Station, Oceana, Va. Atlantic Div., Naval Facilities Engineering Command.
—Security Construction Co., Richmond, Va. $3,100,000. Construction of an aircraft maintenance hanger at the Naval Air Station, Oceana, Va. Atlantic Div., Naval Facilities Engineering Command.
10—United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $2,084,443. Spare parts to support TF-30-P6 engines used on A-7A aircraft. East Hartford. Army Aviation Supply Office, Philadelphia.
—Westinghouse Electric, Pittsburgh, Pa. $1,-900,000. Design and furnishing of reactor plant components for nuclear powered ships. Pittsburgh. Naval Ships Systems Command.
—Maxson Electronics, Old Forge, Pa. $1,-815,446. BULLPUP guided missiles for the Air Force. Old Forge. Naval Air Systems Command.
—Todd Shipyards, Alameda, Calif. $1,644,-365. Overhaul and repair of the attack transport USS Bayfield (APA-33). Alameda. Industrial Manager, 12th Naval Dist.
—National Co., Melrose, Mass. $3,793,054. Radio receivers for use by the Marine Corps. Melrose. Naval Ship Systems Command.
—International Harvester Co., Solar Div., San Diego, Calif. $2,534,229. Auxiliary power plants and related equipment for Navy helicopters. San Diego. Naval Air Systems Command.
11—Granger Assn., Palo Alto, Calif. $2,793,-530. High-power steerable antenna systems for radio stations. Palo Alto. Navy Purchasing Office, Washington, D.C.
—Trenton Textile Engineering & Mfg. Co., Trenton, N.J. $1,029,800. Parachutes for Mark 24 flares. Trenton. Naval Ammunition Depot, Indianapolis, Ind.
12—R. G. Webb, Inc., Riverside, Calif. $2,268,-000. Construction of a Communication Electronics School at the Marine Corps Base, Twentynine Palms, Calif. Southwest Div., Naval Facilities Engineering Command.
13—Triple A Machine Shop, San Francisco. $1,078,000. Repair and alteration of the store ship USS PROCYON (AF-61). Industrial Manager, 12th Naval Dist. San Francisco.
—Scripps Institution of Oceanography, LaJolla, Calif. $1,777,025. Oceanographic research. La Jolla. Office of Naval Research.
16—Lear Siegler, Inc., Grand Rapids, Mich. $3,794,000. Gyroscope assemblies and related equipment. Grand Rapids. Naval Air Systems Command.
17—Sun Electric Corp., Chicago. $1,165,153. Production models of portable hydraulic test stands and related equipment for the Navy and Coast Guard. Chicago. Naval Air Systems Command.
—Boeing Co., Morton, Pa. $25,550,000. Increased long lead time effort for UH/CH-46A helicopers. Morton. Naval Air Systems Command.
—Grumman Aircraft Engineering Corp., Bethpage, N.Y. $1,446,000. Research and development of an integrated ECM system for EA-6B aircraft. Bethpage. Naval Air Systems Command.
18—Western Electric Co., New York City. $1,364,079. Shipboard weapons direction equipment for TARTAR. Burlington, N.C. Naval Ordnance Systems Command.
19—North American Aviation, Anaheim, Calif. $1,207,660. Spare parts for AN/ASB-12 bomb navigation systems for RA-5C aircraft. Anaheim. Navy Aviation Supply Office, Philadelphia.
—Metals Engineering Corp., Greeneville, Tenn. $2,209,030. Fin assemblies for Mark 82 bombs. Greeneville. Navy Ships Parts Control Center, Mechanicsburg, Pa.
20—Jordan Co., Columbus, Ga. $2,632,159. Construction of recruit barracks at the Naval Training Center, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command.
23—Westinghouse Electric, Baltimore, Md. $1,-040,000. Airborne sonar. Baltimore. Naval Air Systems Command.
—United Aircraft, East Hartford, Conn. $16,219,254. T30-P-6 engines. East Hartford. Naval Air Systems Command.
—Douglas Aircraft, Long Beach, Calif. $1,-550,000. Countermeasure sets and related equipment. Long Beach. Naval Air Systems Command.
—Sparton Corp., Jackson, Mich. $1,338,364. Sonobuoys. Jackson. Naval Air Systems Command.
—Otis Elevator Co., Brooklyn, N.Y. $1,260,-169. Sonobuoys. Brooklyn. Naval Air Systems Command.
—B. F. Goodrich Co., Akron, Ohio. $1,168,-104. Tubeless tires for aircraft. Akron. Navy Aviation Supply Office, Philadelphia.
—Litton Systems, Woodland Hills, Calif. $8,792,000. Components of the AN/ASQ-61 ballistic computer system, AN/ASN-31 inertial navigation system for A-6A aircraft, and AN/ASN-36 inertial navigation

system for E-2A aircraft. Woodland Hills. Navy Aviation Supply Office, Philadelphia.

—General Dynamics, San Diego, Calif. $2,624,005. Spare parts for MK 56 mines. San Diego. Naval Ordnance Plant, Louisville, Ky.

—Magnavox Co., Fort Wayne, Ind. $2,326,550. Sonobuoys. Fort Wayne. Naval Air Systems Command.

—Reynolds Metal Co., Richmond, Va. $3,013,000. Motor tubes for 2.75" rockets. Phoenix, Ariz. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Balaban-Gordon Co., New York City. $1,698,130. Rehabilitation of various buildings at the Naval Supply Center, Bayonne, N.J. Eastern Div., Naval Facilities Engineering Command.

24—AVCO Corp., Richmond, Ind. $4,800,333. Design, development, fabrication and testing of an arming and fusing system for use in Mark 17 re-entry vehicles (Minuteman). Richmond. Naval Ordnance Laboratory, White Oak, Md.

—John Hopkins University, Silver Spring, Md. $5,632,348. Research and development work for the Navy, Air Force, Advanced Research Projects Agency and NASA. Silver Spring. Naval Air Systems Command.

25—Amron Corp., Waukesha, Wis. $1,280,248. 20mm steel cartridge cases, Mark 5. Waukesha. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Sea-Land Service, Inc., Elizabeth, N.J. $12,787,200. Two year containership service between Oakland, Calif. and Okinawa. Military Sea Transportation Service.

—Seatrain Lines, Inc., Edgewater, N.J. $10,850,000. Multi-purpose cargo system. Military Sea Transportation Service.

26—Sangamo Electric Co., Springfield, Ill. $2,835,000. Signal data recorder-reproducers for classified Navy equipment. Springfield. Naval Ship Systems Command.

—Star Iron & Steel Co., Tacoma, Wash. $1,373,100. Kingpost mounted missile and boat cranes of 47.5-ton capacity with electro-mechanical drive. Tacoma. U.S. Naval Shipyard, Charleston, S.C.

27—TRW, Inc., Redondo Beach, Calif. $12,113,000. Systems engineering and management support for Navy ASW programs. Redondo Beach. Naval Ordnance Systems Command.

—Aircraft Armaments, Cockeysville, Md. $3,058,443. Design, development, fabrication and testing of a system for evaluating acoustic and torpedo countermeasures. Cockeysville. Naval Ship Systems Command.

31—Pennsylvania State University, University Park, Pa. $1,075,000. Work on the MK 48 torpedo program. Naval Ordnance Systems Command.

—Aerojet General Corp., Sacramento, Calif. $1,825,200. Rocket motors with igniters for TARTER missiles. Sacramento. Naval Ordnance System Command.

—Douglas Aircraft, Long Beach, Calif. $3,500,000. Long lead time effort and materials to support FY 67 procurement of A 4F aircraft. Long Beach. Naval Air Systems Command.

AIR FORCE

2—Gas Equipment Engineering Corp., Milford, Conn. $2,202,050. Production of liquid oxygen/nitrogen generating plants. Milford. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—North American Aviation, Los Angeles. $1,700,000. Work in support of Air Force and National Aeronautics and Space Administration flight test programs. Los Angeles. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

3—Aerojet General Corp., Downey, Calif. $1,542,846. Production of bombs. Downey. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Monarch Machine Tool Co., Sidney, Ohio. $1,441,887. Production of machine tools. Sidney. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Armco Steel Corp., Columbus, Ohio. $2,172,900. Production of components for metal revetments. Middletown, Ohio. Wright-Patterson AFB, Ohio.

4—Lear Siegler, Inc., Grand Rapids, Mich. $1,017,684. Production of components for C-141 aircraft instruments. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—American Electric, Inc., Paramount, Calif. $2,179,757. Production of fin assemblies for bombs. Paramount. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

5—Lockheed Aircraft, Marietta, Ga. $1,800,823. Spare parts for C-141 aircraft engines. Chula Vista, Calif. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—Serv-Air, Inc., Enid, Okla. $1,537,656. Services to include refueling, defueling and aircraft and vehicle maintenance in support of the pilot training program. Sheppard AFB, Tex. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

10—General Electric, West Lynn, Mass. $14,566,664. Production of aircraft engines for T 38 and F-5 aircraft. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Electronic Specialty Co., Los Angeles. $1,940,000. Production of electronic equipment for the RF 4C Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Teledyne Industries, Inc., Garland, Tex. $1,795,985. Research and development of portable seismographic systems. Garland. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

11—Douglas Aircraft, Santa Monica, Calif. $1,502,000. Conversion of THOR missiles to standard launch space boosters. Santa Monica. Space Systems Div. (AFSC), Los Angeles.

—United Aircraft, East Hartford, Conn. $1,301,704. Production of modification kits for J 75 engines. East Hartford. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

12—Sperry Rand Corp., Syosset, N.Y. $1,000,000. Work on the avionics system for the F 111 aircraft. Syosset. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Curtiss Wright Corp., Wood-Ridge, N.J. $1,298,422. Engineering services in support of Navy and Air Force R 3350, R 1820 and R 1300 reciprocating engines. Wood-Ridge. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—Hughes Aircraft, Culver City, Calif. $1,000,000. Work on the avionics system for the F 111 aircraft. Culver City. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

13—Martin-Marietta Corp., Denver, Colo. $3,116,200. Study of Manned Orbiting Laboratory compatibility requirements for the TITAN III program. Denver. Space Systems Div. (AFSC), Los Angeles.

—Hayes International Corp., Birmingham, Ala. $1,153,360. Production of adapters for cluster bombs. Birmingham. Air Proving Ground Center, Eglin AFB, Fla.

—Santa Fe Engineers, Inc., Lancaster, Calif. $2,370,000. Construction of a high thrust research facility. Edwards AFB, Calif. Air Force Flight Test Center.

—Hazeltine Corp., Little Neck, N.Y. $2,893,401. Aircraft communications equipment. Little Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

16—Oakland Construction Co., Mark H. Garr Co. and the Rybert and Garff Construction Co., Salt Lake City, Utah. $2,360,000. Construction of missile training facilities at various air force bases. Corps of Engineers Ballistic Missile Construction Office, Norton AFB, Calif.

—VARO, Inc., Garland, Tex. $4,485,404. Production of ordnance ejector racks for F 4 aircraft. Mexia, Tex. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—General Electric, Evendale, Ohio. $1,502,000. Facilities expansion in support of the J 79 engine program. Evendale. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

18—General Electric, West Lynn, Mass. $2,250,000. Component improvement program for the T 58 helicopter engine. West Lynn. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Honeywell, Inc., Hopkins, Minn. $1,280,000. Production of fuzes for aircraft ordnance. Hopkins. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Pascoe Steel Corp., Pamona, Calif. $1,427,591. Production of pre-fabricated metal buildings. Columbus, Ga. Mobile Air Materiel Area (AFLC), Brookley AFB, Ala.

—Collins Radio Co., Richardson, Tex. $1,040,000. Engineering, production and installation of a ground communication system for Eglin AFB, Fla. Richardson. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—Magnavox Co., Fort Wayne, Ind. $1,123,322. Production of airborne communications equipment. Fort Wayne. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—Lear Siegler, Inc., Grand Rapids, Mich. $1,191,000. Aircraft gyroscopes and spare parts. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

19—Superior Air Products Co., Newark, N.J. $2,207,356. Production of liquid oxygen/nitrogen generating plants and related equipment. Newark. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

20—Emerson Electric Co., St. Louis. $4,505,450. Automatic test equipment for F-111 aircraft. St. Louis. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

23—M.I.T., Cambridge, Mass. $4,090,000. Research and development of advanced electronic programs including space communications. Lexington, Mass. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

—American Electric, Inc., Paramount, Calif. $7,801,190 and $7,454,875. Production of 500- and 750-pound bombs. Mirada, El Cajon and Long Beach, Calif. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

24—Olin Mathieson Chemical Corp., East Alton, Ill. $1,894,400. Cartridge type engine starters for B 52, KC 135 and F 4 aircraft. East Alton. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

25—Goodyear Aerospace Corp., Akron, Ohio. $1,087,790. Production of air cargo handling pallets. Akron. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—Federal Electric Corp., Paramus, N.J. $1,012,554. Work on space communications at Vandenberg AFB, Calif. Air Force Satellite Control Facility, Los Angeles.

26—General Dynamics, Forth Worth, Tex. $1,000,000. Design studies of airborne fire control radar. Fort Worth. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Lockheed Missiles & Space Co., Sunnyvale, Calif. $12,916,000. Launch services for the AGENA rocket from April 1966 to Sept. 1967. Vandenberg AFB, Calif. Space Systems Div. (AFSC), Los Angeles.

—Hughes Aircraft, Culver City, Calif. $2,300,373. Production of components for the F 106 fire control system. Los Angeles. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

27—Boeing Co., Seattle Wash. $2,250,000. T-50 engines for drone helicopters. Seattle. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—North American Aviation, Anaheim, Calif. $1,000,000. Work on the avionics system of the F-111. Anaheim. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Sperry-Rand, Phoenix, Ariz. $1,277,320. Production of calibration instruments for aircraft compasses. Salt Lake City, Utah. Oklahoma City Air Material Area (AFLC), Tinker AFB, Okla.

—Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa. $1,355,700. Production of ducting systems for Air Force wind tunnels. Pittsburgh. Arnold Engineering Development Center (AFSC), Tenn.

31—General Dynamics, San Diego, Calif. $1,134,231. Production of spare parts for the ATLAS/AGENA space booster. San Diego. Space Systems Div. (AFSC), Los Angeles.

—Honeywell, Inc., Hopkins, Minn. $5,238,520. Production of fuzes and related items for aircraft ordnance. Hopkins. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Martin Marietta, Middle River, Md. $2,388,614. F-106 aircraft. Middle River. San Antonio Air Material Area (AFLC), Kelly AFB, Tex.

—Systems Development Corp., Santa Monica, Calif. $1,373,767. Design and development of electronic information and communications equipment for air defense systems. Santa Monica. Electronic Systems Div. (AFSC), L.G. Hanscom Field, Mass.

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DSA Advanced Procurement Planning List Program Established

A new logistics tool, called Advance Procurement Planning Lists (APPL), is now being used by the Defense Supply Agency (DSA) to inform industry about future buying plans. DSA is responsible for purchasing common items for the Military Services.

The primary purpose of the APPL is to furnish advance information to industry with the expectation that individual firms, assisted by this information, can and will systematically schedule DSA requirements along with their normal commercial production, thereby reducing the impact of procurement relative to production capacity and price.

Advance Procurement Planning Lists are also furnished to specific Military Service activities which are responsible for providing procurement technical data. These activities use the lists in validating upcoming procurements prior to solicitation by the DSA supply centers concerned, thus reducing procurement lead time.

Another important use of the APPL is in connection with sole source breakout studies. Very important program (VIP) items and high value items on the APPL are identified and given first review precedence by the individual Center Sole Source Review Panel concerned.

The format for the APPL requires that the list be phased by quarters and include, as a minimum, such specifics as Federal stock number, item name, applicable specification or other technical data, quantity of items and the scheduled period of procurement for each.

All DSA supply centers issue these advance forecasts to industry, usually covering a future period of from six months to one year. The DSA supply centers are as follows:

Defense Personnel Support Center
2800 South 20th St., Philadelphia, Pa. 19101

Defense Construction Supply Center
3990 E. Broad St., Columbus, Ohio 43215

Defense Electronics Supply Center
1507 Wilmington Pike, Dayton, Ohio 45401

Defense General Supply Center
Richmond, Va. 23219

Defense Industrial Supply Center
700 Robbins Ave., Philadelphia, Pa. 19111

Defense Fuel Supply Center
Cameron Station, Alexandria, Va. 22314

CIR Reports Approved

The Defense Department has received Bureau of the Budget approval for the collection of Cost Information Reports (CIR) through DD Forms 1558 through 1558-4.

CIR is designed to collect cost and related data on aircraft, missile and space systems and their components to provide a bank of historical data for use by DOD in estimating and analyzing the costs of weapon system development and production.

Initially, data will be collected on approximately 25 weapon/support systems which are now being selected. Cost Data Plans are now being processed by the OSD Cost Data Plan Review Board composed of representatives from the Offices of Assistant Secretary of Defense (Comptroller), Assistant Secretary of Defense (Systems Analysis) and Assistant Secretary of Defense (Installations and Logistics).

The operation of this subsystem of the Resource Management System will be monitored by the Directorate of Assets Management Systems in the Office of the Assistant Secretary of Defense (Comptroller). The directorate is headed by Colonel Herbert Waldman, USAF, who reports to the Deputy Assistant Secretary of Defense for Management Systems Development.

Defense Department Encourages Skill Development and Training of Nation's Manpower Resources

The following is a letter from Deputy Secretary of Defense Cyrus R. Vance addressed to the defense industry community concerning the need for skill development and training of the nation's manpower resources:

Dear Defense Contractor:

President Johnson in his 1966 Economic Report to the Congress reported, on the sixth year of economic growth, the greatest upsurge of economic well-being in the history of any nation. He referred to several questions being asked about our ability to continue this expansion, including these:

Can our employers find the labor they will require to man their production lines?

Can we avoid bottlenecks in major industries or key skills that would hamper our expansion?

While the President was confident these challenges would be met he stressed that the concerted efforts of industry, labor and the Government were required to achieve the approaching full use of the nation's resources.

In this context, and particularly as we approach full employment, the Secretary of Labor has called attention to the importance of training as a constructive method of meeting manpower requirements. I take this opportunity to join with the Secretary of Labor in emphasizing the concern of the Federal Government that we as a nation improve our skills development programs to meet reasonably foreseeable needs. Anticipating and planning to meet such needs are, of course, obligations first of all of the employers who will need the skilled personnel. This obligation rests with particular force upon those employers who as defense suppliers should be especially forward looking in this regard. I accordingly urge that defense contractors evaluate their requirements across the entire skill spectrum and make affirmative efforts to contribute at least as much through training to the development of the qualified manpower pool in each occupational band as they utilize that pool.

The Secretary of Labor has also advised that employers, desiring advice and assistance in assessing skill development needs and in planning training programs, may obtain such advice and assistance from the Bureau of Apprenticeship and Training of the U. S. Department of Labor. Assistance is available at all occupational levels up through and beyond the apprenticeable trades. Various federal and state resources are available under Department of Labor programs for paying part of the cost. Inquiries can be made at field offices of the bureau which are located in the larger urban centers, and by communicating with its Washington headquarters (Bureau of Apprenticeship and Training, U.S. Department of Labor, Washington, D. C. 20210).

Sincerely,

Cyrus Vance

DEFENSE INDUSTRY BULLETIN

Published by the Department of Defense

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Secretary of Defense

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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Problem Mongers, Solution Mongers and Weapon System Effectiveness

by
Paul J. Sturm
Asst. Dir. (Plans and Policy)
Office of Dir., Defense Research and Engineering

Can cost effectiveness of military research and development be measured? This question has been occupying substantial attention within the Defense Department for some time. To date, findings of internal DOD studies have provided an answer to the question. The answer, simply and ambiguously, is, "It depends."

It depends principally upon three characteristics of the developmental materiel being considered. These characteristics are:

- The conceptual maturity of the program.
- The developmental maturity of the materiel.
- The degree of operational uncertainty involved in the employment concept.

Therefore, before a more unambiguous answer can be developed to the question, "Can the effectiveness of R&D be measured," it's necessary that we examine the fine structure of the objective and maturity of the materiel in question. This article will be concerned with certain aspects of this fine structure and, hopefully, will show by inference that certain end-use-oriented R&D efforts can be measured for effectiveness during the developmental phase, and that the remainder may well suffer from the attempt.

Before we examine the three characteristics just mentioned, it will be useful if we review, at least superficially, the process that determines how new weaponry and support materiel comes into being in the first place. Buried in this exotic mechanism live several unruly boundary conditions that circumscribe and limit the areas of application of the varying forms of systems analysis and other modern study disciplines. The qualitative requirements definition process, which is the name for the way that new materiel is conceived, gestated and reared, is the basic process that incorporates, in one way or another, almost all of the elements involved in the management of organized technical effort, including the setting of objectives, planning, persuasion, analysis, negotiation, decision, and execution or acquisition.

The Development Requirements Process.

In order to normalize our mutual understanding of the development requirements process, stated below is a definition that has been developed for internal use in the Defense Department:

> "The way the Department of Defense evolves the qualitative statements of its needs, and determines the performance characteristics of the materiel necessary to meet those needs."

The process starts with one of two stimuli—with a technological solution or with the emergence of a problem. Later on this will be treated in greater detail. The process peaks in influence on the R&D cycle late in exploratory development and throughout advanced development. Finally, the process continues to exert influence long after initial operational capability, in the form of mod-kits, retrofits and improvements.

Who is involved in this process? A simple answer is: everyone, who, in one way or another, is involved in materiel support of the Military Forces. In this period of technological warfare, this is practically everybody. The President is involved in it. The Cabinet, the Congress, the Bureau of the Budget, the Military Departments, the Defense Secretary, the Joint Chiefs of Staff, the Commanders in Chief and the technological community—the universities, the defense industry and the not-for-profits. Everybody is involved and everyone has an opinion. However, each participant views the process from his own unique perspective.

For this reason, the pattern of this process cannot be isolated by analysis of case histories. That approach was tried. It seemed reasonable that if enough case histories of specific developments could be analyzed, a statistical pattern might emerge from which conclusions could be drawn that were supported by these so-called factual statistics. It soon became apparent, however, from repeated experience, that the many versions of the same case were used by the proponents to "prove" conflicting and usually opposing views of the history of the conception of a project. Redeye, as a classical case, was offered by various individuals as an example of a weapon that was:

- Developed as a result of a stated need.
- Developed in the absence of a stated or recognized need.
- Developed as a consequence of technical innovation.

Experiences like this demonstrated conclusively that the use of case histories to provide an unambiguous representation of the process was completely impractical. This investigation revealed also that a great number of widely differing envisionments existed concerning how the process actually worked in real life.

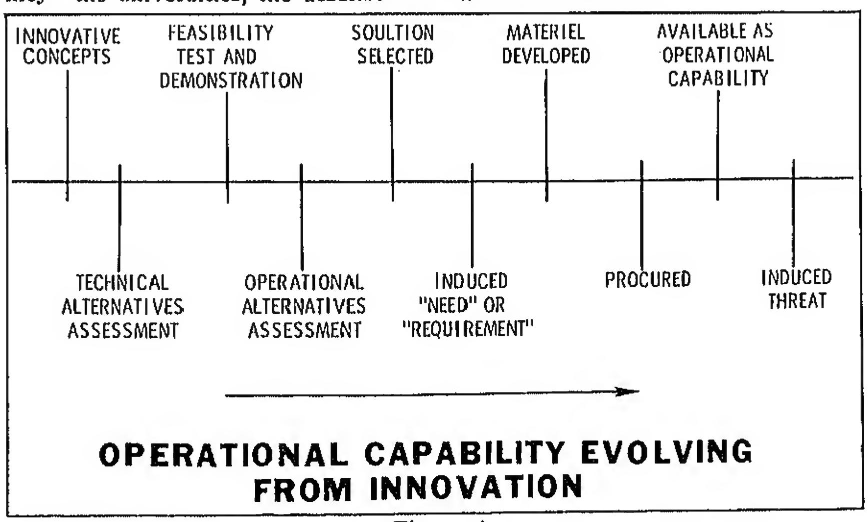

Figure 1.

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In the space available here it is not possible to discuss the many variants that have been constructed on how the process works. However, let's take a look at the two patterns or themes that seem to be repeated in most of these constructions and which appear to be fundamental to the process. At the risk of over-simplification, the idealized planner's view can be depicted as shown in Figure 1. With time elapsing from left to right, this graph spells out how operational capability evolves from the threat or the problem.

Over-simplifying again, the pragmatist's view of the same process can be represented as shown in Figure 2. Here, operational capability, and the threat induced by the availability of the hardware, is derived from the innovation, or the technical opportunity or solution.

If we place these two views adjacent to each other (Figure 3), it becomes apparent that the principal divergence centers around the sequence of the evolution and not over the bench marks, since these on each graph have much in common. Furthermore, the divergence seems to be mostly confined to the period prior to the time that the specific hardware is selected.

Both views have merit. Examples can be found of materiel that has been brought into existence by the route of the planner. Similarly, examples exist of materiel that came into being via the pragmatist's route. However, the issue is somewhat academic since a review of the total spectrum of materiel being acquired today by the Military Departments and Defense agencies will disclose that a very small percentage came into being by way of these purely theoretical routes. Whether the origin of the stimulus was the problem (threat) or the solution (innovation) is immaterial. The bench marks previous to the selection of the final approach are never cleanly defined, expressed, or sequential. Instead these bench marks merely represent activity that takes place at one time or another during the refinement process. In other words, this period, previous to solution selection, is an environment of iteration. This period is unordered and unpredictable and doesn't lend itself very manageably to any sequencing or methodology. It's a stage of continuous, almost random, communication, interchange and negotiation between operational needs and technical possibilities.

This is the early evolutionary phase, then, of the creative process from which weapons and equipments emerge, which shortly thereafter matures into the interplay of the three basic criteria for decision—operational suitability, technical feasibility and cost acceptability. At this early stage of the process, the interplay is principally concerned with operational and technical considerations, with cost playing a decidedly subdominant role. This interchange has been dubbed the requirements definition dialogue, which will be identified later as an identifiable step in the overall process.

In reality then, the real process is a mixture of both theoretical views. While each eventual piece of hardware matures in its own unique way, it matures only as a result of negotiations between those representing operations and those representing technology. In all fairness to the two pure schools of thought, the planner's view is generally identified most closely to projects or programs of an improvement nature, i.e., items that are faster, higher, longer range, etc.; whereas, the pragmatist's idea relates best to programs that are characterized by breakthrough, new capability, quantum jump in the state of the art, etc.

Problem Mongers and Solution Mongers.

Let's for a moment look a little closer at this dialogue between operational needs and technological possibilities. It was pointed out earlier that the necessity for free and unfettered interchange between these two elements is vital to the fault-free definition of needed capability. If the proforma, or paper, process should begin to pace events rather than record them, free and unhampered negotiation between the problem and solution people is inhibited by these paper procedures, theoretical sequence patterns and the need to conform to the organization.

We've adopted the term "problem monger" for those that are looked to for a dispassionate and unprejudiced statement of the problem that needs to be solved; and the term "solution monger" for those who can competently assess what is technically possible in the time frame under consideration. In general, the military professional, with his experience in the combat or operational environment, would normally be looked to for problem statements and, therefore, represents the problem monger. Representatives of the technological community, which includes the technical component of the Military Departments, the universities and the defense industry laboratories, personify the solution mongers.

Unfortunately, however, the problem mongers and solution mongers, nowadays, don't divide up neatly in this fashion. It appears at times that we are living in an age of solution mongers. Many of you are aware of how often new operational needs are described in terms of a preconceived hardware solution rather than by the basic operational problem to be solved. In all fairness, of course, a clear operationally oriented statement of the problem, unprejudiced by a preconceived specific solution, is a difficult task. People have fallen into the habit of specifying future needs in terms of the performance characteristics of a particular pet hardware project rather than in terms of the basic operational characteristics necessary to the successful completion of the mission in the environment of the end user in the field.

At times it seems that the military professional and technological professional are playing musical chairs, in that the Military Departments are

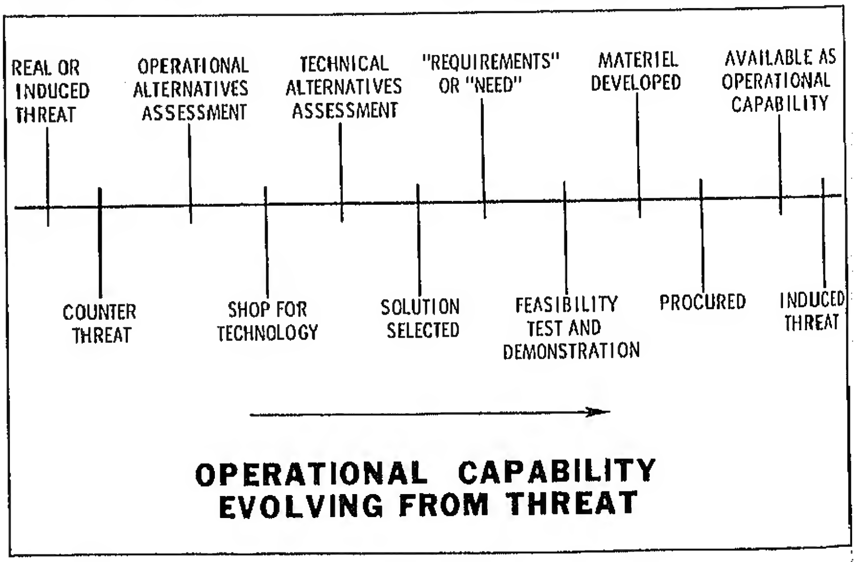


Figure 2.

turning more and more to civilian-dominated contract study organizations for analyses that concern serious strategic and tactical issues. At the same time the Departments busy themselves with the development of technical solutions responsive to the operational problems posed by these civilian-dominated studies. In other words, contract civilian analysts are becoming the problem mongers. Contrasted to this, the military professional, who by virtue of his career should be best qualified for problem stating, instead is working along with the technical professional as a solution monger. It's worth noting that this poses the danger that the military professional has been disenfranchising himself from his rightful participating role as a shaper of the materiel with which he will be equipped for combat operations in the future.

The interjection of staff elements between the problem monger and the solution monger dilutes and distorts the quality of the interchange and reduces the freedom to negotiate. Considerations other than the operational problem and the technical solution are introduced prematurely in this early phase and muddy the dialogue. Important consideration—that only the staff echelons can provide—must obviously shape the ultimate statement of needed capability. But when these considerations receive such visibility in the early stages that they eclipse the clear and consistent statement of the initial operational problem to be solved, the system begins to fault.

In similar fashion, when echelons of organization that are charged with representing the technical solution, and at the same time are expected to represent other considerations—who builds it, how much does it cost, etc.—they similarly introduce premature complication which impedes free interchange. Inhibited communication means faulty capability statements and proposals. Faulty because either they reflect unrealistic technical specifications or the desire for general purpose capability; or faulty, on the other hand, because they are poorly adapted to the end-use environment, because of specifications that are dominated by technology instead of the operational problem.

Since virtually all interposing echelons have a non-linear characteristic, it can readily be seen that, no matter how good the input from the problem and the solution monger, there will be plenty of distortion introduced into the negotiation. Then the output, in the form of a capability statement, is bound to be laced with distortion.

Cost Criterion.

Let's turn now to the cost criterion during the early phase just described. Since RDT&E decisions are based upon three basic criteria—operational, technical and cost—it might appear that the cost issue has been short-changed up to this point in the pattern under consideration. While visibility on cost factors has been low thus far in the process, this shouldn't be construed as a reflection on its importance. Keep in mind that every potential or on-going development project, while in the school of requirements definition, is constantly faced with the necessity of passing a final examination before graduating into inventory, namely the cost-effectiveness test. A major goal of all materiel acquisition is maximum effectiveness at minimum total lifetime cost. Dollar economics can't be limited only to the intrasystem study phase occurring after solution choice. Instead, cost participates in varying degrees with other criteria in disciplining the choice of the specific approach from among the alternatives. Unless cost considerations are factored into the analyses and studies that identify the chosen solution, the proposed program stands a good chance of foundering along the way.

On the other hand, each technical and operational alternative deserves the opportunity for serious consideration and, if promising, feasibility investigation without the inhibition of premature speculation on future costs. Cost estimates taken too seriously too early can well stifle or strangle new concepts or innovations that have latent merit. A proposed solution early in the process, that may at first glance appear to be entirely unacceptable cost-wise, may well evolve into a completely cost acceptable program. Evolutionary refinement and change always occur during the period of feasibility investigation and experimentation. Future cost speculations can destroy or delay a vital future capability before it's even born if they are permitted to inhibit or kill consideration of conceptual options.

When is the appropriate time for the introduction of cost considerations? This is a critical question and difficult to answer. However, to bracket the issue and identify the limits, a few general observations can be made. For virtually all solutions specifically responsive to an operational problem, life-time cost is quite sensitive to choice decisions during the mid-period of the evolutionary cycle. If these choice decisions are made independent of cost acceptability testing—and I distinguish here between cost acceptability testing and cost effectiveness testing—the resulting materiel, later on in the development cycle, may fail formal cost effectiveness tests when, for example, it's a candidate for possible inclusion in the inventory. On the other hand, innovational solutions, feasibility demonstrations and new experimental systems concepts present a somewhat different cost acceptability challenge. The time for the introduction of cost estimates during the early period of this type of project is, of necessity, determined empirically by technically dominated judgment. Premature injection of cost issues here can seriously jeopardize the freedom from unwarranted constraint necessary to the successful maturing of these concepts or innovations.

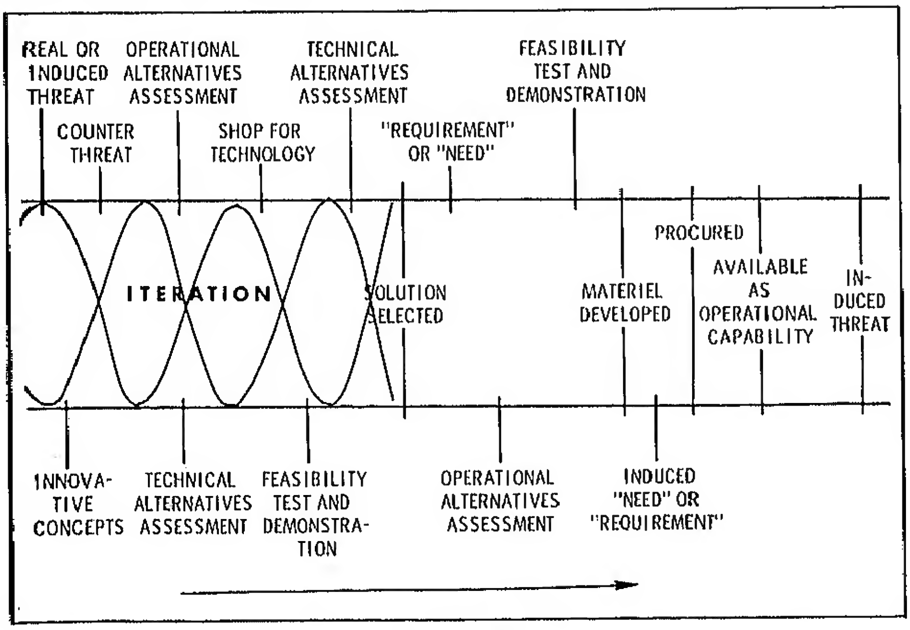


Figure 3.

Nevertheless, undue postponement of economic acceptability testing permits unwarranted freedom from a basic practical discipline. This can lead to wasteful or fruitless development of proposals which may end up on the scrap heap because of cost. The proper time, then, to introduce dollar discipline into this kind of program is a fine point of judgment and depends upon technical acuity, vision and discrimination.

Before we leave this issue, it might be worthwhile to re-emphasize that cost acceptability is increasing in importance each year due, in part, to the terrifying escalation of the economics associated with the increasing sophistication of military weapons and materiel. After all, it's not unusual these days to be considering weapon systems whose total cost represent an impressive percentage of the annual Federal revenue. Small wonder, with figures like these, that everybody, including the Congress, is concerned with this requirements process.

'he Requirement Process and the &D Cycle.

You will note up to this point that he influence of the requirement proc-ss appears to be peaking in the ad-anced development phase of the R&D ycle. Research and exploratory de-elopment are not end-use oriented. They're programmed on a level of ffort basis and aren't directly con-erned with the issue of end use or perational capability. Similarly, dur-ng engineering and operational sys-ems development—when decisions are nostly concerned with whether or not o include in inventory—the issue of eeded qualitative capability (in heory at least) is fairly well frozen. t's worthwhile, therefore, to take a loser look at the character of the dvanced development category of

The strikingly different objectives of these two kinds of advanced development reveals that application of pre-contract definition criteria to innovation proposals will result in stifling the effort, through demand for more and definitive studies and analyses, to justify its funding. A clear understanding of the objective of the project in advanced development, therefore, is necessary in assessing the value of the proposal and the desirability of instituting the effort. In other words, again we see the need for a clear enunciation of the basic problem to which the proposed solution is intended to be responsive. If this statement of the problem is treated superficially or not clearly identified in terms of the objectives contrasted in the breakdown, the proposal or project is in for potential trouble because of evaluation criteria not being matched to the effort.

From the foregoing it may sound as if it's impossible to manage or measure research and development during the needs-definition period in an orderly and understandable way. Admittedly, this environment doesn't lend itself readily to routine or regularized management treatment because of the unordered character of this period and the necessity for opportunism. The manager is always beset with this formidable challenge, i.e., to manage with a light hand at the right time in the cycle so that the very act of management doesn't destroy the immature concepts that need nurturing in this early period. While nursing these concepts during feasibility demonstration, he must test them for operational suitability and, when sufficiently mature, shape them to fit an end-use objective so that the project solves the operational problem in the most efficient way—in other words, so that the operational capability that they will represent will be effective in the intended environment. And finally, the concepts must be harnessed at the right time to the real world of the budget—in other words, can we afford it and is the design optimized and cost conscious?

While the pre-decision activity is disorderly, nevertheless, the challenge just described suggests the three fundamental forms of study that are employed in the generation of materiel. The studies and analyses that work to shape the proposal so it solves the operational problem are identified under the heading of the requirements-definition dialogue. A second form of study, which represents the interchange between operations and cost, is of course the cost-effectiveness analysis. And finally, the studies concerned with optimizing the specific design to maximize its value per dollar expended can be collected under a general heading of technical cost trade-off studies.

These three forms of study, the requirements-definition dialogue, the cost-effectiveness analysis and the technical cost tradeoff, represent analytical interchange between the three bases for decision—operational, technical and cost—and through interaction generate the basic information which the decision maker tests against the criteria of operational suitability, technical feasibility and cost acceptability, in determining whether to initiate or reject a proposed project.

This pattern of studies strives to reduce the disorder of the early R&D environment. It's admittedly a theoretical pattern and obviously will not apply directly to any one specific, since each discrete proposal filters upward to the decision maker according to its own path, that depending on the unique uncertainties of each case.

PRE-CONTRACT DEFINITION ENVIRONMENT

- Project ready for hard engineering and experimental effort already accomplished.
- Technical approach selected is best approach from competing alternatives through convincing trade-off analyses.
- Mission and performances envelopes of project defined and optimized.
- Credible cost and schedule pre-ntation exist.
- 'avorable cost-effectiveness pre-tions available.
- pecific military requirement
- valuations made in end-use/spe-olution-oriented environment.

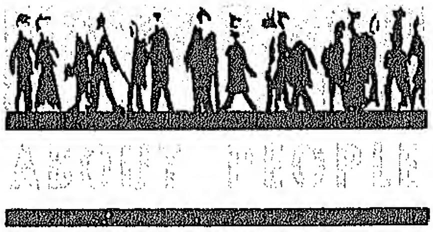
Figure 4.

INNOVATION ENVIRONMENT

- Programs are principally study and experimental effort to demonstrate feasibility.
- Concepts are principal issue, with alternative solutions incidental to effort.
- Project concerned with feasibility and not susceptible to optimization.
- Definitive cost and schedule considerations premature.
- Cost-effectiveness analyses may be academic due to unrefined concept of employment.
- Firm military requirements contingent upon feasibility demonstration.
- Definitive end use difficult to define and subject to results of feasibility demonstration.

Figure 5.

(*Continued on page* 16



DEPARTMENT OF DEFENSE

B. F. Coggan has been appointed a special consultant to the Asst. Secretary of Defense (Manpower) with responsibility for reviewing the management of military medical facilities, commissaries, post exchanges and other related support services concerned with the health, welfare and recreation of military personnel. Mr. Coggan is president of the San Diego International Development Corp., and has held executive positions in various industries.

Lt. Gen. Fred M. Dean USAF, Asst. Dir., Weapons Evaluation and Control, U.S. Arms Control and Disarmament Agency, has been named Dep. Commander in Chief, U.S. Strike Command. He will assume his new position Aug. 1.

Maj. Gen. Marvin L. McNickle, USAF, has been nominated for promotion to lieutenant general and designated Dep. Dir., Defense Research and Engineering (Administration and Management).

Brig. Gen. Robert C. Richardson, III, USAF, formerly Dep. Chief of Staff, Science and Technology, Air Force Systems Command, has been assigned duty as Dep. Commander, Field Command (Weapons and Training), Defense Atomic Support Agency, Sandia Base, N.M.

DEPARTMENT OF THE ARMY

Seven top ranking Army general officers are affected by a series of major reassignments as follows: Gen. Dwight E. Beach has been named Commander-in-Chief, U. S. Army, Pacific, replacing Gen. John K. Waters, who is retiring. Replacing Gen. Beach as Commanding General, Eighth U. S. Army; Commander, U. S. Forces, Korea; and Commander-in-Chief, United Nations Command, is Lt. Gen. Charles H. Bonesteel III, who has been Dir. of Special Studies in the Office of the Army Chief of Staff. Gen. Bonesteel has been nominated for promotion to full general. Lt. Gen. John L. Throckmorton, previously Chief of the Army's Office of Reserve Components, replaces Gen. Bonesteel. Gen. Throckmorton's replacement is Lt. Gen. Charles W. G. Rich, who has been Dep. Commanding General, Eighth U. S. Army. Lt. Gen. Vernon P. Mock, previously Dep. Chief of Staff for Military Operations, replaces Gen. Rich. Maj. Gen. Harry J. Lemley, Jr., Commandant of the U. S Army Command and General Staff College and Commanding General, U. S. Army Combat Developments Command's Combined Arms Group, replaces Gen. Mock. Gen. Lemley has been nominated for promotion to lieutenant general.

Lt. Gen. Robert Hackett, previously Comptroller of the Army, is the new Commanding General of the U. S. Army Air Defense Command, replacing Lt. Gen. Charles B. Duff who has retired. Maj. Gen. Ferdinand J. Chesarek, who has been nominated for promotion to lieutenant general, replaces Gen. Hackett as Army Comptroller.

New assignments in the headquarters of the U. S. Army Strategic Communications Command are: Col. Eugene L. Weeks, Dep. Chief of Staff for Logistics; Col. William G. Skinner, Dep. Chief of Staff, Comptroller; and Col. Lawrence R. Klar, Dir., Communications Engineering Dept.

Col. E. J. McGinnis has been assigned as Dir., Procurement and Production, of the Army Missile Command, Huntsville, Ala.

The new Commanding Officer of the Rock Island (Ill.) Arsenal is Col. Harry A. Snyder.

DEPARTMENT OF THE NAVY

RAdm. Francis J. Blouin has been named to succeed VAdm. Bernard F. Roeder as Commander, Amphibious Force Pacific. Adm. Roeder will take command of the First Fleet in San Diego. VAdm. Lawson P. Ramage, who has been Commander of the First Fleet, has been assigned as Dep. Commander-in-Chief, U. S. Pacific Fleet.

RAdm. Elmo R. Zumwalt, Jr., has been assigned as Dir. of the Systems Analysis Group, Office of the Chief of Naval Operations.

RAdm. Frank C. Jones is the new Dep. Chief of Naval Material (Logistic Support) replacing Capt. John B. Ritch who has retired.

RAdm. William C. Richardson, SC, has been assigned as Supply Officer, Philadelphia Naval Shipyard.

Maj. Gen. James M. Masters, Sr., USMC, has been nominated for promotion to lieutenant general and assigned as Commandant of Marine Corps Schools, Quantico, Va. He succeeds Lt. Gen. Frederick L. Wieseman who has retired.

DEPARTMENT OF THE AIR FORCE

Gen. Bruce K. Holloway has been designated Vice Chief of Staff, USAF, effective Aug. 1, replacing Gen. W. H. Blanchard, deceased. Lt. Gen. Maurice A. Preston, Commander, U.S. Forces, Japan, and the 5th Air Force, will replace Gen. Holloway as Commander, U.S. Air Forces in Europe.

Lt. Gen. Joseph R. Holzapple, presently Dir., Weapon Systems Evaluation Group, has been named Dep. Chief of Staff, Research and Development, USAF, effective Sept. 1.

Lt. Gen. Richard M. Montgomery, Vice Commander in Chief, U. S. Air Forces in Europe, will retire Aug. 31. His replacement is Maj. Gen. Arthur C. Agan, Jr., who has been nominated for promotion to lieutenant general.

Lt. Gen. Henry Viccellio will become Commander, Continental Air Command, on Aug. 1; Lt. General Sam Maddux, Jr., assumed command of the Air Training Command on July 1; Lt. Gen. Joseph H. Moore became Vice Commander in Chief, Pacific Air Forces, on July 1; Maj. Gen. Seth J. McKee, nominated for promotion to lieutenant general, will become Commander, U. S. Forces, Japan, and Commander, 5th Air Force, on Aug. 1; Maj. Gen. Robert A. Breitweiser will become Vice Commander, Military Airlift Command, on Aug. 1; Lt. Gen. William W. Momyer became Dep. Commander, Military Assistance Command, Vietnam, for Air Operations and Commander, 7th Air Force, on July 1; and Col. Paul R. Stoney became Vice Commander, Air Force Communications Service, on July 1.

New assignments in the Air Force Systems Command are: Lt. Gen. L. I. Davis, Commander, National Range Div., additional duty as DOD Manager for Manned Space Flight Support Operations, effective Sept. 8; Maj. Gen. Andrew J. Kinney, Commander, Air Proving Ground Center, Aug. 1; Maj. Gen. John L. McCoy, Commander, Ballistic Systems Div., Aug. 1; Brig. Gen. Arthur W. Cruikshank, Jr., Dep. Commander for Minuteman, Ballistic Systems Div., Aug. 1; Brig. Gen. John S. Chandler, Asst. Dep. for F–111, Aeronautical Systems Div., Sept. 1; Brig. Gen. Gustav E. Lundquist, Commander, Systems Engineering Group, additional duty as Dep. Commander, Research and Technology Div., Aug. 1; Brig. Gen. Thomas S. Jeffrey, Jr., Vice Commander, Aeronautical Systems Div., Sep. 1; and Col. Walter R. Hedrick, Jr., Dep. Commander for Space, Air Force Systems Command.

New assignments in the Air Force Logistics Command are: Maj. Gen. Lewis E. Lyle, Dir. of Maintenance Engineering, Air Force Logistic Command; Brig. Gen. Leo P. Geary, Dep. Commander, San Antonio Air Materiel Area; and Brig. Gen. Clarence J. Galligan, Dep. Commander, Sacramento Air Materiel Area.

Maj. Gen. Thomas G. Corbin has been assigned as Commander, Special Air Warfare Center, Tactical Air Command, effective Sept. 1.

OMEGA—A World-wide Navigation System

by
Capt. M. X. Polk, USN

One of the most urgent needs of a modern, far-ranging Navy is a truly world-wide navigation system—one that can be used at all times and under all conditions, and that can give accurate, reliable fixes in a few seconds. Such a system is needed for stationing ships and submarines, for locating unknown targets reported by barrier patrols and picket ships, and for controlling fleets spread over many miles of oceans. It is needed for navigating in the difficult regions around the poles, for submarine cruising under and for aircraft flying above the polar icepack, as well as for ships operating in the higher latitudes and in other areas not currently covered by electronic navigation systems. Such a system has been developed by the Navy and is currently being evaluated under the direction of the Chief of Naval Material. It is known as the OMEGA Navigation System.

To be most effective, a world-wide navigation system must have four attributes: reliability, accuracy, long range and flexibility. Its reliability should be such that it is useable at all times of day or night. Its accuracy must be equal to demanding operational needs. Its range should enable it to cover the entire globe, preferably with overlapping or redundant coverage in areas in which most operation may be expected. To be most economical, this coverage should be achieved with a minimum number of stations. To provide maximum utility, a single navigation system should be useable by surface ships, aircraft and completely submerged submarines. It is the objective of OMEGA to do all of these to a degree that reflects the maximizing of system cost effectiveness.

Just what is OMEGA? OMEGA is in many ways similar to LORAN, which has provided reliable navigation over parts of the world for 20 years or more. The new system, however, operates at the very lowest radio frequencies where radio propagation covers thousands of miles with exceptional reliability. As in LORAN, there will be a number of stations sending signals that agree in time to a millionth of a second, but OMEGA will need only eight stations for world-wide coverage whereas the 100 or more LORAN stations serve only a fraction of the earth's surface. The signals from these eight stations, when compared with each other, will define an electromagnetic grid, somewhat like the lines of latitude and longitude on the surface of the earth. This grid can be measured in several ways including techniques of the future that have not yet been invented.

How does OMEGA work? Basically, it is a time-shared system. Each transmitting station transmits a pulse at a given time in a pre-arranged frequency, then waits for the other synchronized stations to transmit their pulse in turn. Each pulse is slightly different in length to aid in recognition at the receiver. The navigator's receiver will receive the pulses from those stations within range, automatically measure the phase difference of the carrier from pulse pairs and indicate on direct reading dials or counters the phase difference measured. When integrated over a number of pulses, the phase difference measurement becomes extremely accurate, and fixes with average accuracies of a mile or better can be obtained at maximum ranges from the transmitting stations. The circuitry developed to provide such accurate phase measurements makes use of modern signal processing techniques and allows operation at fractional signal-to-noise ratios; that is, when the OMEGA signal is much smaller than the atmospheric noise, it may still be received and utilized for the phase information it contains.

Capt. M. X. Polk, USN, is Project Manager for the OMEGA Navigation System. His prior assignments were Head of the Surveillance, Navigation and ECM Branch, Bureau of Ships, and as Naval Weapons Liaison Officer with the Advanced Research Projects Agency. Capt. Polk holds a B. S. Degree in Chemical Engineering from Clemson College and a doctorate from Lehigh University.

In 1966 three stations at permanent sites will be in continuous operation, although with less than full power. One other lower-power station at Forrestport, N.Y., will be used on an interim basis. This network will be used for operational development and for an operational evaluation of new receivers now being delivered. At a future date the Forrestport, N.Y., station will be replaced by a permanent station. These four stations will then provide from approximately 0° -90° N and 0° -180°W, thus providing navigation in all waters adjacent to the U.S. coasts as well as the United States itself.

A technical data collection program involving surface and submarine forces has been under way since 1961. Tests conducted as part of this program indicate that a relative fix accuracy of less than 450 yards is attainable and that an absolute accuracy of one-two miles can be realized with an operational OMEGA system.

Significant accomplishments have been achieved in the development program. Experiments in the late 1950's and early 1960's have shown that the stability and predictability of propagation in the Very Low Frequency (VLF) 10-14 kc band over long ranges are very suitable for a navigation system. Feasibility of the system at sea has been proven in operational exercises involving numerous naval units over significant periods of time. At sea, use has also been demonstrated by Coast Guard and foreign ships. This has been done in Atlantic, Pacific and Caribbean waters. Receivers have been designed and test-flown in aircraft. Results from U.S. Navy flights in South American, Asian, South Pacific, Caribbean, Continental United States and the Arctic areas have demonstrated conclusively that the system is suitable for air-

craft use. The Royal Aircraft Establishment has also been investigating VLF navigation for commercial aircraft and has reached similar conclusions as a result of its test program. Working closely and actively with it, the Federal Aviation Agency is engaged in a program which will optimize the use of VLF navigation aids for commercial aircraft.

The feasibility of the use of VLF navigation in ships, low-performance (propellor driven) aircraft and completely submerged submarines has been proven, and engineering development work for stations and receivers has been completed for a general purpose navigation system having accuracies of one or two nautical miles. Such a system could now be implemented. However, during the development program it was realized that the system had greater potential than could be seen at the beginning. As a result, development of receiving equipment for supersonic single place aircraft has recently been undertaken. This equipment will include a computer which will read out latitude and longitude and other navigation information. The requirement for a navigator is thus eliminated. Studies have shown that the ambiguities of phase measuring navigation systems can be eliminated. Therefore, an engineering effort has been started to demonstrate the validity of these studies.

The OMEGA system will also provide world-wide standard frequency broadcasts. With its all-weather, full-time, world-wide coverage, and the inherent stability of transmissions in the VLF range, the OMEGA system is ideal for such a purpose. The four station network, which will be operating in 1966, will be synchronized to the ultra-precise Naval Observatory time and frequency standard, as well as having three atomic frequency standards at each station.

OMEGA is designed so that receivers may be operated automatically for maximum convenience and reliability, or manually for minimum cost. Signal format is such that receivers can cost from as little as $1,000 to a maximum dictated by user convenience requirements. Every effort has been made to foresee the techniques and requirements of the future and to design the system so that it will be useful for many years to come.

This, then, is the OMEGA Navigation System—a system with a future of valued, versatile and efficient service to surface ships, submarines and aircraft of the United States and her allies. Although there are some R&D efforts for system improvement, OMEGA is presently capable of being implemented as the first world-wide, man-made navigation system. An OMEGA Navigation System Project Management Office (PM-9) has been established under the Chief of Naval Material. This office directs, coordinates and serves as a focal point for all efforts concerning the development, evaluation, implementation and operation of the OMEGA system. Although the Navy has sponsored the development of this system, it becomes apparent that future operations will require the close cooperation of many agencies in the United States and several other countries. The Federal Aviation Agency, in rather close collaboration with the British Ministry of Aviation, assumes responsibility for determining the feasibility of OMEGA for civil aviation and especially for the guidance of the supersonic transport of the next decade. The Air Force has loaned the Forrestport transmitting station and an aircraft for flight evaluation tests; the Army has supported tests of the capability of OMEGA for helicopter navigation. The Navy will operate the transmitting stations during a three- or four-year period of development and testing. After the system becomes fully operational, it is planned that the Coast Guard will assume responsibility for operating all of the transmitting stations.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July 1965—April 1966	July 1964—April 1965
Procurement from All Firms	$25,737,577	$20,020,718
Procurement from Small Business Firms	5,592,782	4,052,136
Percent Small Business	21.7	20.2

Navy Guide Available From G.P.O.

A new publication of the Naval Material Command, the "Guide for the Preparation of Proposed Technical Approaches (PTA)," NAVMAT P3910A, is available for purchase from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The price is $1.50 per copy.

The purpose of the publication is to provide guidelines for the preparation of Proposed Technical Approaches (PTA) documents and an explanation of the need for the information required therein. The guide is organized into 12 sections which parallel the Proposed Technical Approaches format required by existing Navy directives. At the end of each section a check list is provided to emphasize the major points which should be covered in the section concerned.

The new guide is a companion to the "Guide for the Preparation of Technical Development Plans (TDP)," NAVMAT P 3910, dated July 1965, which can also be obtained from the Government Printing Office for $1.75 per copy.

USAF Report on Tactical Air Capabilities Available Thru DDC

A report classified Secret, covering a study on Air Force tactical air operations and problems made by the Air Force Scientific Advisory Board, is available to DOD contractors with required "need to know" and security clearance through the Defense Documentation Center (DDC). It is titled "Air Force Review of USAF Scientific Advisory Board Tactical Air Capabilities Task Force Final Report." The DDC order number is AD-372 744.

This document combines some 150 Scientific Advisory Board conclusions and recommendations contained in its report completed in June 1965 and the Air Force comments which were forwarded to the board in January 1966. The report covers the following areas: aircraft, logistics, reconnaissance, avionics, command and control, weapons and munitions, test and evaluation, meteorology and engineering geology.

Authorized DOD contractors and grantees may request this document from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

Government Agencies Seek Innovations in Education and Training

by
Roy K. Davenport
Dep. Asst. Secretary of Defense (Manpower, Planning and Research)
Office of Asst. Secretary of Defense (Manpower)

Government officials challenged industry to apply its advanced technologies and problem-solving capabilities in improving the quality of education and training at the Conference on Engineering Systems for Education and Training held in Washington, D. C., on June 14 and 15. The conference was sponsored by the Defense Department with the participation of the Office of Education and in affiliation with the National Security Industrial Association.

Much more stimulating and productive than had been anticipated, the conference was attended by over 500 representatives of industry and 250 Federal officials, both military and civilian. For the benefit of those who attended and for other interested readers of the *Bulletin*, in this article I would like to emphasize several points made during the conference. A complete transcript of the proceedings will be available in August through the National Security Industrial Association.

To begin with, the cost of individual training of the Military Establishment amounts to $4 billion annually. Of this amount $2 billion is spent on training of enlisted men of which half is used for basic military training. These figures suggest that even small improvements can produce very significant dividends to our military readiness and we seek industry's ideas in developing better management techniques, individual motivation, selection techniques and reduction of attrition rates.

After basic training, the enlistee must become proficient in one or more of some 1,500 skill areas. Only 12 percent of our men fire weapons, while 50 percent are trained in technical skills. Our basic training investment in the enlistee is about $1,200. Skill training requires an additional investment of from $2,000 to $12,000 per man. However, since our first term reenlistment rates are only 20 percent, we must optimize time spent in training versus time spent on the job to get a return on our investment.

In addition to training our enlisted men, we must provide continuous education for our 325,000-man officer corps. About 65,000 officers engage in some form of professional education each year at a cost of $400 million. Others are involved in costly training programs. Pilot training, for example, costs about $1 billion a year ranging from $250,000 for a jet pilot to $45,000 for a helicopter pilot. Here we want to know whether or not more use should be made of university advanced courses, whether some education and training courses can be reduced in time, and whether off-duty education through self-instructional techniques is desirable.

Costs of other Defense training includes $90 million for secondary overseas schools for military dependents. Additional costs are incurred to operate 33 correspondence schools.

I feel that industry, as an employer, will recognize it has a high stake in the quality of military education and training. Ninety-six percent of our enlisted men and 84 percent of our officers retire in time to have second careers in civilian life. About 16 percent of our nation's total work force has obtained vocational training in the Armed Services. In a very real sense industry has a vested interest in the type, magnitude and quality of the training which we provide for some of its future employees.

Besides contributing to the nation's total manpower pool, the Defense Department can play an important role which is highly relevant to evolution of the education technology industry. To the extent that we promote innovations in education and training, DOD offers itself as a huge laboratory to facilitate translation of education research into education technology. This underlies our desire to work closely with demonstration centers in universities and with the emerging "education industry." In his keynote response Dr. J. Sterling Livingston of Harvard University, a speaker at the conference, cogently remarked:

> **"Heretofore, the industry has been unable to find within our educational establishment the opportunity needed to demonstrate the effectiveness of its advanced technology. . . . Our public school systems have not been in a position to be responsive to bold new experiments in education. Industry often has been thwarted in taking initiative and frustrated in its efforts to find a market for its new concepts. . . . This conference underscores the fact that, whereas our education establishment may be slow in responding to advances in technology, our Military Services are leaders in applying new techniques in the classroom. . . . Our Federal Government is now creating through the Office of Education, the Department of Labor, the Office of Economic Opportunity and the Department of Defense a new opportunity for the education technology industry to demonstrate the value of its innovations and to gain support for research and development."**

While we are proud of the progress which we have made in training through the applications of advanced technologies and management concepts in the Defense Department, we are constantly seeking new solutions to old training problems. I believe that industry will find real opportunities to apply the full range of its expertise—from research and development, to prototype, to final production—in particular areas. Herein lies the opportunity for development of new ideas, techniques and equipment and the demonstration of their effectiveness not only to the military but also to school systems, industrialists and other consumers in the education market.

The Defense Department is anxious to consider industry's proposals in helping us achieve the five objectives we are setting:

- First, we need to systematically challenge course content to make certain that it is directly correlated with on-the-job performance requirements, and geared to the minimum mental level which can perform the task with full satisfaction. With about 2,700 courses given to 1.8 million students

(*Continued on page* 13)

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SEPTEMBER 1966

SPEAKERS CALENDAR

DEPARTMENT OF THE ARMY

Hon. W. Brewster Kopp, Asst. Secretary of the Army (Financial Management), at Army Comptrollership School Commencement, Syracuse, N. Y., July 29.

Brig. Gen. Lloyd B. Ramsey, Dep. Chief of Information, at 9th Infantry Div. Reunion Dinner, Shoreham Hotel, Washington, D. C., July 30.

DEPARTMENT OF THE NAVY

RAdm. Henry H. Caldwell, Commander, Fleet Air Jacksonville, at Douglas Aircraft Co. Management Club Meeting, Sacramento, Calif., Sept. 21.

Hon. Paul H. Nitze, Secretary of the Navy, at Institute of Electrical and Electronics Engineers Convention, Washington, D. C., Oct. 3.

Mr. Paul R. Miller, Asst. for Quality Control, Special Projects Office, at American Institute of Engineers Region Two Conference, Atlantic City, N. J., Oct. 13.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. B. I. Funk, Commander, Space Systems Div., Air Force Systems Command, at California State College, Long Beach, Calif., Aug. 8.

Gen. J. P. McConnell, Chief of Staff, USAF, at Cheney Award Luncheon, Washington, D. C., Aug. 9. (Appearance only); at Defense Orientation Conference Assn. Meeting, Washington, D. C., Sept. 30.

Gen. H. M. Estes, Commander, Military Airlift Command, at National Defense Transportation Assn. Meeting, Atlanta, Ga., Aug. 11.

Hon. L. Marks, Jr., Asst. Secretary of the Air Force (Financial Management), at CPA Society Meeting, Los Angeles, Calif., Sept. 12.

Gen. G. P. Disosway, Commander, Tactical Air Command, at Chamber of Commerce Meeting, Oklahoma City, Okla., Sept. 16.

Maj. Gen. H. E. Humfeld, Commander, 1st Strategic Aerospace Div., at National Security Industrial Assn. Meeting, Vandenberg AFB, Calif., Sept. 23.

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff, Systems and Logistics, at U. S. Air Force Institute of Technology Symposium, Sunnyvale, Calif., Oct. 5.

DIPEC Standards Improve Property Management

Two primary responsibilities assigned to the Defense Industrial Plant Equipment Center (DIPEC), in Memphis, Tenn., are to maintain master property records of DOD-owned industrial plant equipment (IPE) and to redistribute idle IPE.

High value items of DOD-owned equipment such as IPE are individually controlled and managed through a system of property records which provides a means for maintaining continuous visibility over such information as location, program use, age, condition and cost. Good descriptions are of critical importance to property management at all levels and to effective redistribution when property becomes idle.

DIPEC is developing standards for describing IPE which Defense activities can use in preparing property records for their own management uses and for reporting idle IPE to DIPEC. These standards will improve communications among Defense activities and between Defense activities and their contractors. Of equal importance is their adaptation to mechanized processing of information, thus reducing administrative workloads and costs. Many large private companies have adapted, or are in the process of adapting, these standards to their own management improvement programs.

DIPEC standards are published in handbooks listed below with the number, title and Federal Supply Classification (FSC):

DSAH 4215.1—Electrical and Electronic Properties Measuring and Testing Instruments, FSC 6625, $1.25.

DSAH 4215.2—Woodworking Machines, FSC 3220, $0.75.

DSAH 4215.3—Supplement to Production Equipment Directory D1 Metal-Working Machinery 1960 Revision, FSC 3411 thru 3419, 3441 thru 3449, $2.00.

DSAH 4215.4—Industrial Furnaces and Ovens, FSC 3424, 3655, 4430, Volume 1, $2.25; Volume 2, $1.75.

DSAH 4215.5—Material Handling Equipment and Lifting Electro-Magnets, FSC 3815, 3910, 3920, 3930, 3950, 3990, Volume 1, $1.50; Volume 2, $1.50.

DSAH 4215.6—Physical Properties Testing Equipment, FSC 6635, $1.75.

DSAH 4215.7—Wrapping and Packaging Machinery, FSC 3540, $0.60.

DSAH 4215.8—Textile Industries Machinery and Industrial Sewing Machines, FSC 3520, 3530, 3625, $0.45.

DSAH 4215.9—Distribution and Power Station Transformers, FSC 6120, $0.65.

DSAH 4215.10, Environmental Chambers, FSC 6636, $0.70.

DSAH 4215.11—Power Conversion Equipment, Electrical, FSC 6130, $0.65.

DSAH 4215.12—Rolling Mills, Drawing Machines and Metal Finishing Equipment, FSC 3422, 3426, $1.50.

DSAH 4215.13—Portable Machine Tools and Toolroom Layout Plates and Tables, FSC 3450, 3460, 5220, $1.00.

DSAH 4215.14—Compressors and Vacuum Pumps, FSC 4310, $1.25.

DSAH 4215.15—Liquid and Gas, Pressure, Temperature, Humidity and Mechanical Motion Measuring and Controlling Instruments, FSC 6680, 6685, $0.65.

DSAH 4215.16—Crystal and Glass Industries Machinery, FSC 3635, $0.45.

DSAH 4215.17—Driers, Dehydrators and Anhydrators, FSC 4440, $0.45.

Distribution of the handbooks has been made through normal channels to defense contractors and to military activities. Defense contractors who have not been furnished copies of the handbooks for use in managing Government-owned IPE should request them through their appropriate Government representatives. The handbooks may also be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, at the cost indicated in the listing.

Other handbooks are in the process of being published or being prepared for publication. Notice will be given when they are available.

CALENDAR OF EVENTS

Aug. 13-14: Greater Cleveland Air Show, Burke-Lakefront, Cleveland, Ohio.

Aug. 23-26: Institute of Electrical and Electronics Engineers Western Electronic Show and Conference, Los Angeles, Calif.

Aug. 29-31: Institute of Electrical and Electronics Engineers Ocean Electronics Symposium, Honolulu, Hawaii.

Sept. 2-5: Canadian International Air Show, National Exhibition Park, Toronto, Ontario, Canada.

Sept. 5-11: National Championship Air Race, Reno, Nev.

Sept. 11-16: American Chemical Society Meeting, New York City.

Sept. 13-15: National Security Industrial Assn-U. S. Air Force Electronics Conference (Secret), Murray Hall, U. S. Naval Station, Boston, Mass.

Sept. 14-16: Annual Air Force Assn. Fall Meeting, Sheraton Park Hotel, Washington, D. C.

Sept. 17-18: Midwestern Aviation and Space Exposition, Willow Run Airport, Detroit, Mich.

Sept. 19-20: Government-Industry Procurement Clinic, Portland, Ore.

Sept. 22-23: Government-Industry Procurement Clinic, Seattle, Wash.

Sept. 26-28: Sixth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, U. S. Naval Air Turbine Test Station, Princeton, N. J.

Sept. 28-29: National Security Industrial Assn. Marine Geodesy Symposium, Columbus, Ohio.

Oct. 10-12: 1966 Assn. of the U.S. Army Meeting, Sheraton-Park Hotel, Washington, D.C.

SMC—AMC Consolidated

The U. S. Army Supply and Maintenance Command (SMC) was merged with the Army Materiel Command (AMC) on July 1 placing direct control of field installations and activities, formerly under SMC, under AMC. The merger will clarify command responsibilities, expedite the decision-making process, and provide a more cohesive and responsive organization with focus on the development and support of materiel to meet requirements of the field forces.

A physical regrouping of the two headquarters last year in the Washington, D.C., area has facilitated the consolidation. Staff elements were relocated to bring together elements doing similar functions. The consolidated AMC will continue to be housed in Building T-7, the Nassif Building, and the Naval Weapons Plant.

MEETINGS AND SYMPOSIA

AUGUST

Electron Spin Resonance Spectroscopy Seminar, Aug. 1-3, at Michigan State University, East Lansing, Mich. Sponsors: Army Research Office-Durham, Atomic Energy Commission, American Chemical Society and Michigan State University. Contact: Dr. David R. Squire, Chemistry Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N. C., 27706, (Area Code 919) 286-2285.

1966 Linguistic Institute Conference on Linguistic Method, Aug. 1-3, at the University of California at Los Angeles. Sponsor: Air Force Office of Scientific Research. Contact: R. W. Swanson (SRI), Air Force Office of Scientific Research, Washington, D. C. 20333, (Area Code 202) OXford 6-5374.

Eleventh International Symposium on Combustion, Aug. 14-20, at the University of California, Berkeley, Calif. Co-sponsors: Ballistic Research Laboratory and the Combustion Institute of Pittsburgh, Pa. Contact: Dr. R. J. Heaston, Physical Sciences Div. Army Research Office, 3045 Columbia Pike, Arlington, Va., (Area Code 202) OXford 4-3465.

Second Computer & Information Sciences Symposium on Learning, Adaptation and Control in Information Systems, Aug. 22-24, at Columbus, Ohio. Sponsors: Office of Naval Research, Battelle Memorial Institute and Ohio State University. Contact: Julius T. Tou, COINS Co-Chairman, Director, Communications Science Research Center, Battelle Memorial Institute, Columbus, Ohio 43201.

Application of Generalized Functions to System Theory Conference, Aug. 25-26, at the State University of New York, Stony Brook, N. Y. Co-sponsors: Air Force Office of Scientific Research and Society for Industrial and Applied Mathematics. Contact: Capt. John Jones, Jr. (SRMA), Air Force Office of Scientific Research, Washington, D. C. 20333, (Area Code 202) OXford 6-1302.

Unguided Rocket Ballistics Symposium, Aug. 30-Sept. 1, at Texas Western College, El Paso, Tex. Sponsor: Army Electronics Research & Development Agency. Contact: V. C. Cochran, Army Electronics Research & Development Agency, White Sands Missile Range, N.M., 88002.

SEPTEMBER

U. S. National Committee for Pure and Applied Biophysics in connection with Second International Biophysics Congress, Sept. 5-9, in Vienna, Austria. Sponsors: Office of Naval Research and National Academy of Sciences-National Research Council. Contact: Mrs. P. H. Tenniswood (Code 444) Office of Naval Research, Washington, D. C. 20360, (Area Code 202) OXford 6-1538.

Twelfth Annual Seminar of the American Society for Industrial Security, Sept. 20-22, at Sheraton Hotel, Philadelphia, Pa. Sponsor: American Society for Industrial Security. Contact: J. L. Graves, Public Relations Chairman, P. O. Box 8117, Philadelphia, Pa. 19101, (Area Code 215) 823-3747.

Symposium on Gastrointestinal Radiation Injury, Sept. 25-28, at Richland, Wash. Co-sponsors: U. S. Atomic Energy Commission and Battelle-Northwest. Contact: Dr. Marcus F. Sullivan, Biology Dept., Battelle-Northwest, P. O. Box 999, Richland, Wash. 99352.

Symposium on Galio-Marinide, Sept. 26-27, at Wales and England. Sponsor: Research and Techonolgy Division, Air Force Systems Command. Contact: R. W. Runnells (AVN), Air Force Avionics Laboratory, Research and Technology Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio 45433, (Area Code 513) 253-7111, ext. 63802.

Sixth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Sept. 26-28, at the Nassau Inn, Princeton, N. J. Sponsor: U. S. Naval Air Turbine Test Station. Contact: Dennis A. Wysocki, Conference Vice-Chairman, U. S. Naval Air Turbine Test Station, P. O. Box 1716, 1440 Parkway Ave., Trenton, N. J. 08607, (Area Code 609) 882-1414, ext. 355.

Sixth Symposium on Naval Hydrodynamics, Maneuverability, Waves and Physics of Fluids, Sept. 29-30, Oct. 3-4, at the Statler Hilton Hotel, Washington, D. C. Sponsor: Office of Naval Research. Contact: S. W. Doroff or P. Granville, Office of Naval Research, Code 438, U. S. Department of the Navy, Washington, D. C. 20360, (Area Code 202) OXford 6-1433 or OXford 6-6839.

AOA Annual Meeting Scheduled

The 48th Annual Defense Preparedness Meeting of the American Ordnance Association will be held in Los Angeles and at Edwards AFB, Calif., on October 5-6, 1966. The U. S. Air Force is the host Military Service at this year's meeting.

The meeting is designed to provide an opportunity for Air Force representatives to discuss "Military Aircraft of the Future" before an audience of representatives from the aircraft and related industries and to allow these representatives to see the newest aircraft of the Air Force in both static and aerial displays.

FROM THE SPEAKERS ROSTRUM

Address by Mr. James W. Roach, Asst. Dir. (Engineering Management), Office of Dir. of Defense Research & Engineering, at the DOD Advanced Planning Briefings for Industry, San Francisco, Calif., April 12, 1966.

James W. Roach

Management Trends in Defense R&D

Research and development is a major Defense program. Through this program the DOD obtains the weapons and systems needed by the Military Services, as well as the technology and building blocks these major systems depend upon.

Obviously a program that costs $7 billion a year, and has more than 100 major projects important to national defense, demands and receives continuing management attention. Part of that attention is to assure that the policies we establish and use fit well with the practical business of developing and producing hardware. I will talk to you about that part of our management review that may result in some modification of current policies. Some of these possible changes in policies could affect the way you do business with the DOD.

Some of the policy changes we are considering aim at preventing future problems. Others relate quite directly to our day-to-day activities. I will describe both kinds of problems and the actions we are taking to solve them. These actions, when analyzed and related to each other, provide insight to the management trends in Defense R&D.

Like our counterparts in industry, we have a continuing need to improve how the top R&D echelon—or corporate level—manages the efforts of subordinate activities. This problem extends through all levels of Defense R&D management, but I think you will be most interested in two specific and closely related parts of the problem:

- The management of the Defense in-house R&D activity.
- The management of the R&D effort provided by industry. A separate, more general problem is how to improve the R&D response to short-range user needs, such as those arising in Vietnam.

Considering your interests, I will amplify two of the problems: "Management of Contract R&D" and "Response to Vietnam." However, to set the stage I will first describe certain actions being taken to solve part of the problem of "Management by Top R&D Echelons." These actions can be summarized as better expression of intent in three areas:

- Improved definition of the job to be done.
- More effective selection of the optimum contractor.
- Improved control of the defined contract.

Improved definition of the job has been emphasized by contract definition preceded by concept formulation. This policy was released by DOD Directive 3200.9. Concept formulation is the process for answering the necessary questions regarding alternate operational approaches and alternate technical solutions, as well as the cost and operational effectiveness of these approaches and solutions. Concept formulation is the basis for the prime management decision—should the project enter engineering development, considering that the objective of engineering development is development with strong intent for deploying to operational inventory? This is a key decision, with significant military and resources implications. Therefore, the concept formulation must be comprehensive and searching, yet very timely.

Contract definition is both the validation action and the action required for precise definition of the contract. Contract definition does not mean the over-definition of the details of the system to be developed but rather the precise definition of the performance of the system and the contract to achieve that performance.

To date, 14 major projects have passed through some type of contract definition: five Air Force projects, six Navy, and three Army. These projects include such systems as Titan III, Lance, MACS, IHAS and ILAAS, Mark 48 Torpedo, C-5A, AAFSS and Poseidon. Not all of these contract definitions have gone smoothly nor have all achieved the objectives established for contract definition. We have learned that the concept is good but occasionally the implementation is lacking. Our future action will be directed toward improving the implementation. Currently, contract definition is planned for FDL, Mark II Avionics and SAM-D.

More effective contractor selection follows logically from the contract definition effort. Contract definition attempts to give the competitors the best possible avenue for "displaying their wares." Our source selection policy, released in DOD Directive 4105.62, attempts to establish the best possible climate for judging the contractors' "wares" against DOD needs. The source selection policy brings in all affected parties to the decision—developer, user, logistician, financier; the policy provides checks and balances through both specialist and generalist participation.

Several of the projects which have gone through contract definition have

also utilized the recently-released source selection policy. Particularly satisfying have been the source selection efforts of the Navy's Condor and Walleye, the Army's AAFSS and the Air Force's C-5A.

Following contractor selection, we all need to exercise improved control of the defined job. Key to this control is the control exercised by the contractor through the high motivation contract negotiated as an output of contract definition. To supplement, but not constrain the contractor, the DOD is developing a revised policy on configuration management and on the performance measurement system to be used to monitor the development and production effort. Configuration management is a discipline being developed to strike the proper balance between the latitude necessary to the developing contractor and the needs of the DOD for precise definition of the configuration. We are attempting to balance these apparently conflicting needs by a gradual increase in the details of configuration definition as the design effort progresses.

Let's turn to an analysis of the management of contract R&D. For the past few years, emphasis has been placed on contracting for development by means of performance specifications. This may be through the use of system performance specifications or performance specifications for the major elements of the system, or through a combination. Here again we must exercise caution. There is a natural tendency to specify design details of the system elements, thereby destroying design latitude. In addition, certain other techniques such as pre-contract detailing of the functional requirements of each element may defeat the objectives of contracting by overall performance specifications.

Configuration management fortifies the performance specification concept for development. As presently conceived, it utilizes a progressively more detailed definition of configuration as design and test proceeds. Control of the configuration at any point in time will be exercised against the configuration identification developed to that point.

Our current revision efforts on CITE (Contractor Independent Technical Effort) have, as a prime objective, improved capabilities from contractor independent R&D. This objective will be achieved through increased contractor latitude to select those CITE projects which will enhance his own R&D efforts and, therefore, his responsiveness to DOD. These CITE projects may range (at the contractor's discretion) from independent research efforts through development to bidding and proposed efforts on a solicited or unsolicited basis. We hope to foster this latitude by providing a more equitable means of negotiating a reasonable ceiling for total CITE funds within which the contractor may exercise his management judgment on project selection.

The Weighted Guidelines for Profit Determination is an action which tends to improve the management of Defense acquisition by rewarding high contract performance and conversely penalizing for poor performance. Results to date indicate a significant increase in as-negotiated profit rates. Using a base period of 1959 through 1963, significant increases have occurred in as-negotiated profit rates for 1964 and 1965. It is too early to have statistically significant facts on realized profit—either as a percentage of sales or as a percentage of investment. Similarly, it is too early to determine whether DOD is getting improved performance for these increased, as-negotiated profit rates. However, close attention is continuing on the profit rate picture.

I mentioned earlier that the key to improved management of contract R&D is the motivation provided by a well-defined contract with the proper incentives built in. DOD actions to achieve well-defined contracts with proper incentives are well known. There have been some successes and there have been some failures. We continue to press for better implementation of the incentive concept. More than half of our engineering and operational systems developments utilize some form of incentive contracts. Lesser use is appropriate and evident in the less clearly defined effort that takes place in the earlier development categories and in research.

A recent problem concerns team arrangements made for the proposal effort and the development of a particular project. Certain actions by DOD have been interpreted as a policy change against team arrangements. This problem has been brought to the attention of the top management levels in the OSD and in the Services. It appears that a policy statement is needed that would recognize the validity and desirability of team arrangements, and would establish the general rule that team arrangements will be honored subject to the DOD right to direct specific substitution of a team member for a specific, substantive reason.

The Total Package Procurement concept is being tested on three major projects: the C-5A, the FDL Transport and SRAM. I would like to use the concept as an illustration of an improvement in the management of contract R&D. There are many who feel that the follow-on production of a project is a greater motivation for improved performance than are higher profit rates in development. I believe there are many motivations, and total package should stimulate the follow-on production motivation as weighted guidelines attempts to stimulate the reputation—or image-motivation.

Another action under way to improve management of contract R&D is the development of CWAS, Contractor Weighted Average Share of Cost Risk. It is appropriate to point out that CWAS implementation should have a beneficial result on contract R&D management because of its promise of increased contractor management latitude via the operation of a highly motivating, cost risk environment.

Turning to the second problem area —R&D response to Vietnam—there are those who have expressed the concern that programming, contract definition, etc., may drastically constrain the response rate of R&D to short term user needs such as those of Vietnam. This is a concern of R&D management and several actions have been taken to increase the timeliness and effectiveness of R&D response. Most of these actions have been directed toward accelerating our current development concepts rather than starting a totally new management system for quick-reaction developments.

A closer tie in of the user's need and the R&D agency's proposed solution has been required for some time. On the larger, longer-term projects, the requirements of concept formulation and contract definition provide this needed link. For the short term needs, special arrangements are in use

to provide a quick-response interface between user needs and R&D proposed solutions.

Since 1964 there has been a Vietnam Joint Research and Test Activity (JRATA) established by the Joint Chiefs of Staff and the Director of Defense Research and Engineering. Its mission is to test and evaluate the combat potential of any new equipment. JRATA operates under the direction of Brigadier General John Boles who reports to General Westmoreland. General Boles' organization is making major contributions to our operational capability in evaluation of new hardware and particularly in operational employment studies of such equipment. An example of the latter is a recent effort by the Army element of JRATA which recommended a change in the Vietnamese artillery doctrine and increased its effectiveness by several times. . . .

This past year, General Westmoreland established a section within the MACV Command whose sole responsibility is to obtain from field commanders expressions of their urgent needs. There is a direct link from MACV to the Service R&D organizations. The Vietnam-need statements receive first priority over all other longer-term requirements. The Services have established streamlined procedures for processing and developing solutions to these needs. A regular exchange of information on requirements and their resultant R&D projects has been established. Four joint Service/ARPA technical teams (Mobility, Communications, Surveillance and Weapons) have visited Vietnam repeatedly for detailed analysis and evaluation. Last summer, MACV identified many problem areas. All have been reviewed to determine means of satisfying these needs. There are many projects, most of them previously in existence, aimed at satisfying these problem areas. We estimate that about 75 percent of these R&D problem areas will be satisfied by some item in operation by January 1967.

Coupled with these improvements in the requirements identification process and in the evaluation activity, there have been similar improvements in the R&D organizations—improvements which serve to increase the response rate. Two examples of improved R&D organizations are the Army's Limited War Laboratory in Aberdeen and the Air Force's Special Air Warfare Center at Eglin.

The war in Vietnam has many facets, varying from counter-insurgency against terrorists in the villages to combat against the organized regular army units from North Vietnam. There is an almost infinite variety of equipment required. Many examples can be mentioned ranging from the normal developments accelerated for Vietnam, such as the lightweight AR15 or M16 rifle and the M79 40mm grenade launcher, to the quick-response developments like the improved jungle boot. . . .

The Aberdeen Limited War Laboratory had been conducting some preliminary investigation of armor plating of commercial vehicles. In November 1964 the laboratory received a request from Vietnam for Armor Kits for the Scout vehicles (protection for the driver and passenger from small arms fire and mine fragments). The lab delivered 12 kits to Vietnam in June 1965, seven months after the initial request. . . .

This streamlined system for meeting the short-term needs is not yet complete. We are taking steps to improve further our communications with Vietnam to keep abreast of their problems and to tell them of our progress. In addition, we must marshal more of the potential contribution of the Defense R&D community.

These remarks on actions taken to solve R&D problems illustrate the management trends in Defense R&D. I can summarize these trends into three terse statements:

- Improved techniques for internal DOD development management.
- Increased contractor latitude when coupled with increased motivation.
- Improved response to short-range user needs.

Education and Training

(*Continued from page* 8)

each year, this research task is a mammoth undertaking. We need to start this program by perfecting the techniques for such assessments.

- Second, we must seek ways to communicate the necessary knowledge and skill to each student in the optimum period of time—neither too much nor too little. We believe it may be possible to reduce training time in many courses. A key technique is to give each individual in technical training a chance to proceed at his own pace. Use of this approach will require much greater automation and more sophisticated engineering techniques.
- Third, we need to expose more of our people to more information on an "as needed" basis. With devices for information storage and retrieval, random access and high speed communications, it seems to us that the time is fast approaching when knowledge can be more widely and immediately accessible—both for classroom training and for use on the job, thus minimizing the amount of knowledge which must be gained in the classroom itself.
- Fourth, we need to raise the standards in instruction to the highest level of quality and effectiveness by the use of pre-recorded instruction flowing from the best teachers and the best materials—communicated by tape, film, television, computers and other devices to students at multiple locations.
- Fifth, we need to apply planning and quality control techniques with rapid feedback to our teachers from on-the-job performance. Our quality controls should be comparable in precision to the techniques employed in the production of today's most sophisticated aerospace systems.

These are our objectives. We solicit the assistance of industry in engineering systems to achieve them.

In discussing the design of a truly creative partnership between Government and industry before a group of leading businessmen last May, President Johnson stated:

> **"There are numerous cases where the technology is already at hand but is awaiting a demonstration of its practicality and the creation of a market. One contribution the Federal Government can make is in helping to overcome the reluctance to accept promising innovations by making possible their demonstration and evaluation."**

This is the basis for our partnership approach with industry. The Defense Department seeks the assistance of industry in improving the effectiveness of our fighting forces. In turn, we in the Defense Department are anxious to provide industry the opportunity to innovate in this endeavor. And the nation on the whole will benefit.

Microelectronics: A Technological Revolution

by

Lt. Gen. W. A. Davis, USAF
Vice Commander, Air Force Systems Command

The new technology of microelectronics promises to change greatly the living patterns of future generations of Americans. Some of these changes are already beginning to influence the lives of many people today.

The tremendous progress of this new technology is a result of the nation's need to meet the complex electronic demands for advanced ballistic missile and space systems and avionics equipment. Indications are that the peaceful benefits of microelectronics may, in time, far out-distance its military applications.

Civilian benefits from this type of space-age research are virtually unlimited. Use of microelectronics in the home of tomorrow will include temperature-sensitive ovens that will cook a roast or bake a cake perfectly every time; and air conditioning and heating systems that will analyze the temperature and humidity at several points in a home to keep the rooms at a constant, desired level. High-volume home-entertainment circuitry is on the visible horizon, with the major channel of news, information and entertainment incorporated in a single integrated system and with a high-speed electronic printer for recording any information the viewer wishes to retain.

Applications in other areas may include wristwatch radios and TV sets, invisible hearing aids and desk-top computers. Pocket-size radio telephones may become commonplace in the not-too-distant future.

Microelectronics is a general term to describe a number of approaches for increasing reliability, while decreasing the weight and size of electronic equipment. In one, the components are diffused or grown into a silicon flake known as a "chip," and in another a thin film process is used for layering the components on the silicon chip. Microelectronics differs from microminiaturization in that the latter simply reduces the size of electronic components, while microelectronics utilizes several new techniques of circuits.

Integrated circuits are built by a specific diffusion construction technique which generally starts with the basic ingredient of ultra-pure silicon. Certain "impurities" with specific characteristics are added in controlled amounts and the mixture is grown into a material which, when properly excited, will perform a basic electronic function.

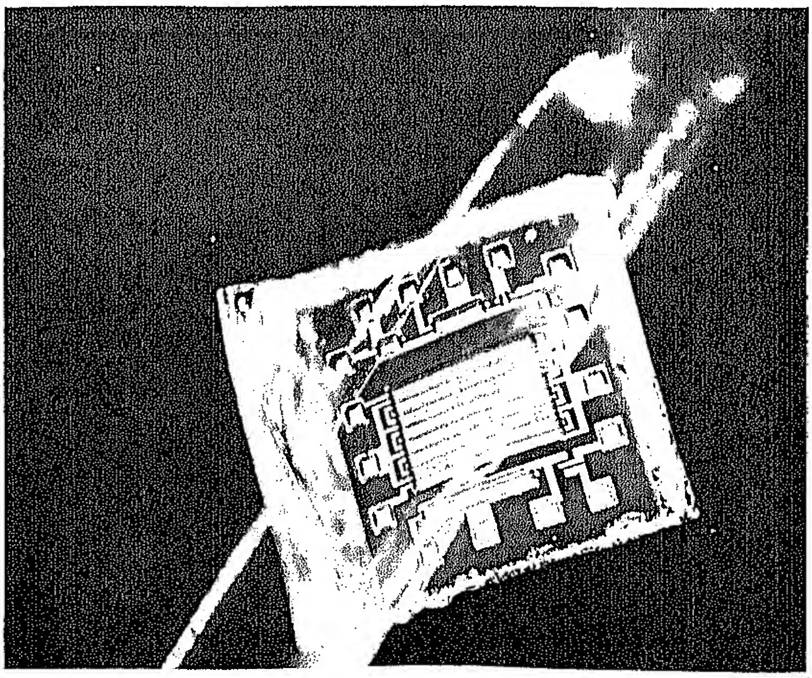
A dozen or more of the functions, or circuits, may be incorporated into a silicon flake chip no larger than the head of a pin. Up to 500 circuits can be placed in an area no larger than the eraser at the end of a pencil. One of these chips can perform the same work which would require a large number of electron tubes or transistors and perform it more reliably.

Floyd E. Wenger, a pioneer in the field of microelectronics who served as reliability assistant in the Systems Effectiveness Division of the Air Force Systems Command, compares the new technology with the technique used by a housewife when she takes various raw ingredients, mixes them in a ratio and processes them in a certain manner to produce a cake.

The housewife does not have to worry too much about the amount of impurities in the materials. This is not true, however, in the processing of integrated circuits. The materials used must be refined and purified until there is less than one part of impurity or contamination in a billion parts of the material.

The room in which the chips are grown and processed must be surgically clean. Any contamination upsets the chemical material balance and degrades the operational capability and reliability of the devices.

Since the active, transistor-like function and the other circuit components are an integral part of the chip, and in a homogeneous mass, the reliability of the chip becomes the reliability of the various materials used in the process and the extremely precise processing techniques involved in their manufacture. A great benefit of this new technology is that external connections, which are a great cause of unreliability and increased weight in circuitry employing conventional tubes, transistors, resistors and capacitors, are largely



This microcircuit equivalent of a six-transistor radio fits in the eye of a sewing needle. New combinations of materials—single crystal silicon on sapphire—are used to provide the required electrical isolation within the small area available.

eliminated by the integrated circuit.

Wenger is convinced that integrated circuit technology is a natural for use in the construction of digital, or counting-type circuits, such as those used in many computers and control devices. It lends itself to mass production; and the cost of chips containing from ten to fifty different electronic circuits is only slightly higher than the cost for single circuit devices.

Analogue, or measuring circuits, are not as far advanced from the application standpoint as the digital devices, but a rosy future is predicted for their ultimate use.

It is forecast that the majority of commercial computers and business machines will be using integrated circuits within a three-year period.

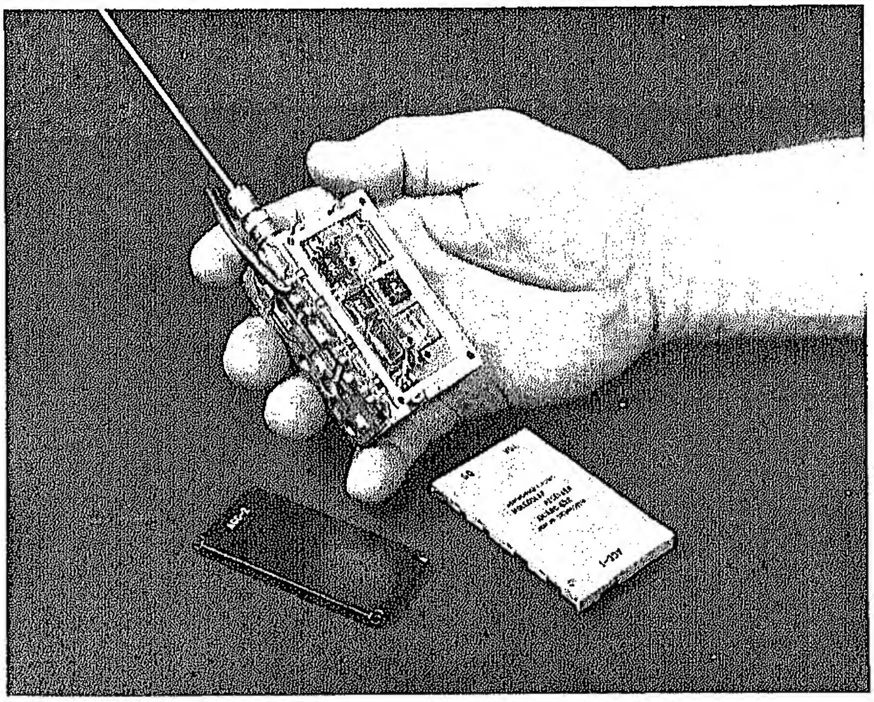
Calculator and adding machine companies are presently evaluating their practical applications. Their superiority will make them candidates for all types of instrumentation, data processing systems and machine equipment control, which involves programming a machine to handle a complete manufacturing or other process by electronic means.

Air Force involvement in microelectronics, which started Government/industry research in this new technology, came about through the development of highly sophisticated weapon systems.

By the mid-1950's, the space and global operations of the Air Force had become highly dependent upon electronic aids. These devices, built with techniques borrowed by the early radio pioneers from the electrical industry, were growing larger, heavier and more complex. At the same time they were becoming less reliable. This led to tremendous maintenance and logistic support problems.

It was at this critical period that the concept of microelectronic circuits emerged and was grasped by the Air Research and Development Command, predecessor of today's Air Force Systems Command, as a highly promising solution to the mounting problems.

The concept of molecular electronics, which is the use of a single block of material to perform the function of an entire circuit, came into being. This concept was proposed to industry by the Air Force and a contract was awarded for its exploitation in 1959. This stimulated an explosion of industry effort and resulted in the silicon integrated circuit.



The AN/ARC-63 communications receiver was the first non-digital equipment to make extensive use of integrated circuits—with a resulting 35 to 1 reduction in size and weight over a comparable transistor version of the same receiver.

Ultra-miniaturization is only a happy by-product of the new electronics, with reliability its main advantage. The guidance systems of the Minuteman II ICBM have proven the advantage of microelectronics, with a 50 percent weight reduction, an increased reliability factor of ten and a resulting decrease in maintenance costs.

The best data on transistors used in the first Minuteman missile system indicated failures on the order of one every 100,000 hours. Extensive life tests of the new integrated circuits indicate a failure rate of less than one every 20 million hours.

Experts indicate the life of electronics in a system will be as long or longer than many of the systems which contain them. If they can predict the failures, spares can be sent along with the new equipment. Self-identifying fault detectors can be built into the system to instantly recognize troubles, thereby lowering maintenance costs.

Beyond the measurable benefits are broader implications relating to operational system effectiveness. It is hard to attach a value to decreases in the "down time" of military aircraft or to the maintenance of ballistic missiles and bombers because force readiness and the maintenance of a specified force level are difficult to "cost." Microelectronics will give added performance efficiency and effectiveness to weapons capabilities.

The demonstrated success of integrated circuits in the Minuteman and other programs has led the Air Force to consider them for much wider applications. Consequently, the Air Force Systems Command is urging the maximum practical application of microelectronic devices in all new system and equipment designs, as well as for product improvement in existing equipment.

A report covering the development, growth and future of microelectronics has been published in booklet form by the Air Force Systems Command. It is titled, "Integrated Circuits Come of Age," and is available to industry representatives without charge.

Requests for copies should be sent to Air Force Systems Command, Attn. SCEP, Andrews AFB, Washington, D. C. 20331.

However, the three forms of study discussed here are conducted formally or informally to assure that pertinent factors are weighed into a decision. If these studies are too informal or superficial, or should be interfered with by organizational, bureaucratic, or procedural rigidity, or are sequenced improperly, the system will fault, and the proposal will suffer as a consequence. The sequence of these studies is not always predictable but generally tends to follow that given. The requirements-definition dialogue initiates activity; cost-effectiveness analyses generally come into play at an appropriate time after the dialogue has matured sufficiently; finally, technical cost tradeoffs phase into the activity.

R&D Effectiveness Quantification.

But to repeat our earlier question: When is the appropriate time for the application of cost effectiveness testing? And under what conditions can cost and effectiveness be tested constructively? We are now back to the original issue, namely, "Can the effectiveness of R&D be measured?" The answer to this question supplied at the beginning of this article was, "It depends."

It depends, as stated earlier, on the three characteristics of the materiel, namely:

- The conceptual maturity.
- The developmental maturity.
- The degree of operational uncertainty.

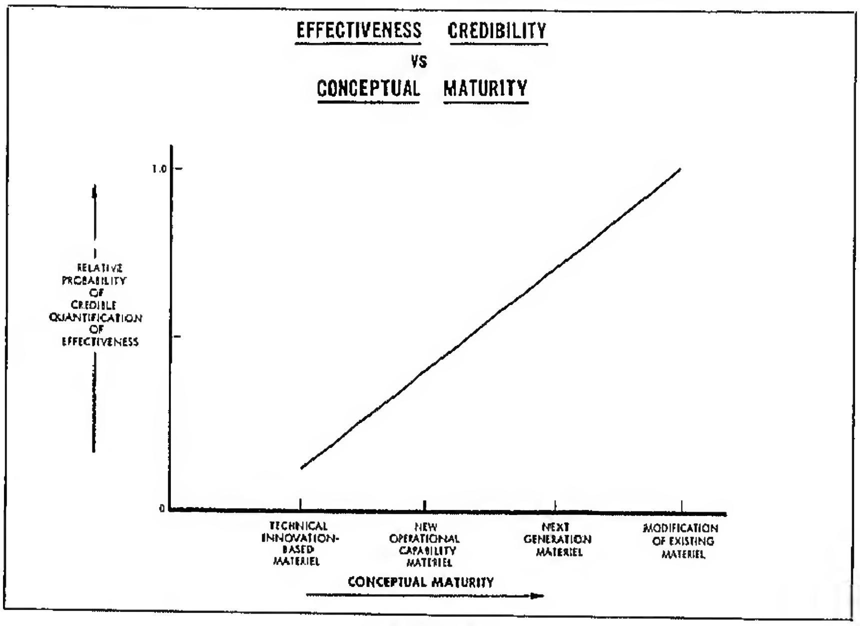


Figure 6.

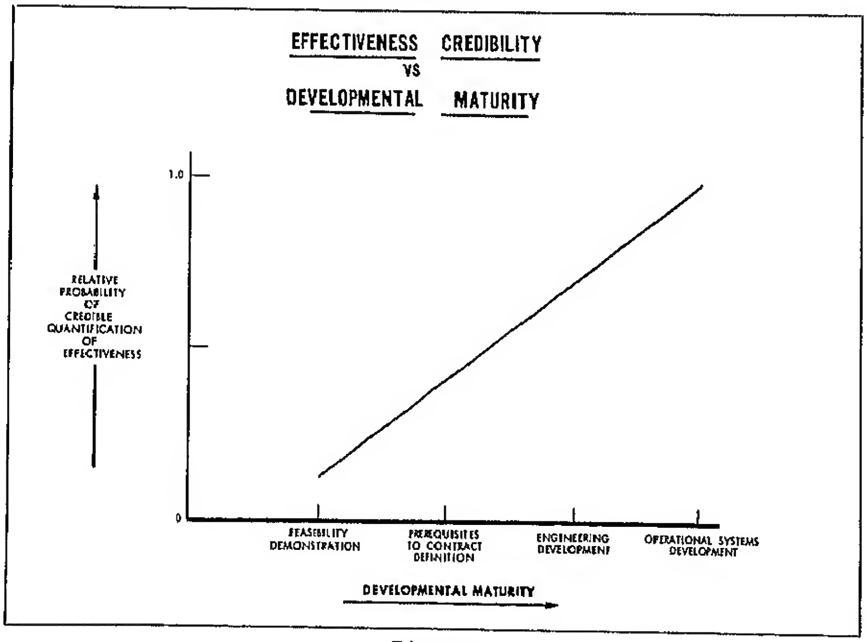


Figure 7.

Let's examine these characteristics in greater detail. Figure 6 is a qualitative representation of the relationship between the probability that the analyst can develop credible quantification of effectiveness against the conceptual maturity of the materiel. You will note that the probability of credible quantification increases as the character of the materiel moves away from the innovation environment toward the more mature and more quantifiable environment of next generation or existing materiel. This chart is strictly qualitative, intended simply to delineate the character of the relationship. The curve is probably not a straight line, for example, but this is incidental. You will recall from the foregoing that care must be exercised to protect innovative operational and technological concepts against premature effectiveness and cost inhibition. If indeed credible quantifications of effectiveness are hard to come by, for materiel concerned with innovational concepts or new operational capability, the probability of error is more likely in any derivative analysis than when effectiveness testing is concerned with materiel more conceptually mature.

Strong inference applied to the requirements definition process will confirm the validity of this relationship, so let's move on to the next characteristic of evolving materiel, namely, the developmental maturity.

Charted in Figure 7 is the relationship between probability of credible effectiveness quantification and the developmental maturity of materiel. Requirements definition again supports the validity of this qualitative relationship, namely, that there is a higher degree of uncertainty in effectiveness quantification prior to engineering for end use and that effectiveness quantification is more readily and credibly developed after the materiel is engineered with the objective of operational inventory. Again the definitive slope of the curve is incidental for our purposes.

Finally, let's examine the last characteristic of R&D materiel, i.e., the degree of operational uncertainty implicit in the genesis of the proposed materiel. Operational uncertainty is complex and intractable. To a great extent, this derives from the fact that the credibility of effectiveness quantifications is determined by the degree to which the component factors that make up these numbers can be controlled. And operational uncertainty is not readily amenable to control.

Let's go back for a moment to the problem monger and solution monger concept. But first let me recount a story that was used by a senior cost effectiveness analyst during a presentation on the utility of cost effectiveness in R&D. The analyst described a recipe he had seen for hassenpfeffer that was contained in a 19th century cookbook. The recipe opened with the inexorable logic—"First, catch a hare." Obviously, this is the first step. The analyst argued, nevertheless, that this was not the first step but a derivative of the earlier requirement, namely, the necessity of first getting the recipe to tell you to catch a hare. The analyst drew the analogy that, while it might appear that the obvious first requirement for cost effectiveness studies is to have something needing effectiveness measurement and costing, in reality that is not first. According to him, first there must exist the problem of choice. And to have a choice challenge, there must be alternatives.

The analyst stopped at this point, having illustrated his position. However, let's examine the sufficiency of this position in the case of combat materiel for a moment. If we can agree that effectiveness measurement is concerned with the various alternative solutions to a problem operating in the intended environment, then it appears that the analyst is missing a point. While the cost element of his analyses is concerned with the alternative solutions, the effectiveness element is concerned with both solution and the operational problem that stimulated the generation of the solution alternative. This must be so, if we intend to measure the effectiveness of the solution "in its intended environment," since the intended environment of combat materiel includes the very problem, or threat, that initiated the whole exercise. This consideration is always involved in the credibility of effectiveness quantifications for materiel destined for combat interaction.

Let's test this consideration. Here is a definition of cost effectiveness that appeared in a paper in the journal of the Operations Research Society of America:

> **"Cost effectiveness analysis is an analytical technique for evaluating the broad management and economic implications of alternative choices of action, with the objective of assisting in the identification of the preferred choice."**

Note the words "alternative choices of action" and "preferred choice." Choices of action are solutions to some problem stimulus. But what is the problem requiring solution? The problem is to counter a threat, and there are two kinds of threats—the threats associated with combat interaction and threats implicit in the support of combat forces that are intended for direct combat interaction. Materiel developed to counter those threats implicit in non-combat support operations tends to be susceptible to methodological treatment and effectiveness quantification. On the other hand, materiel intended as a solution to the threats of direct combat interaction presents a monumental challenge to the quantifying analyst, especially considering the man/machine involvements and the indeterminacy of the conflict environment.

The tendency to evade the issue of operational uncertainty is obvious in the literature. A publication with a chapter on the rudiments of model building contained the following statement, quoted out of context:

> **"The enemy's reaction and his shift in defense weapons and tactics as we change our offense vehicles may be quantifiable in principal, but a formidable problem in practice—one that is often passed over in silence. Mixed forces and time-phasing may be left out of the model because of the computational difficulties they introduce."** [1]

The temptation to "suppress" operational uncertainty is great. But suppression of the basic pivotal factor, that brought the proposed materiel under consideration in the first place, would appear to be specious logic that can result in academic findings, or an erroneous series of findings that could well destroy important incipient new weapons.

[1] *"Analysis for Military Decisions," E. S. Quade, p. 69.*

Let's turn now to Figure 8 which sets forth the relationship between the probability of credible quantifications and the maturity of materiel intended for operation in the differing environments just mentioned. For materiel intended to operate in a scenario of lower operational uncertainty, labeled on the chart "combat interaction—none," the rate of increase of credible quantifications with evolutional maturity is quite high. In other words, this category of materiel during engineering development can probably be measured for effectiveness with reasonably high credibility.

Examples of this category of materiel might be the C-5A heavy logistics aircraft and possibly the Fast Deployment Logistic Ship. This materiel is generally not intended to close with the enemy in combat and the uncertainty that he represents does not as a rule perturb the environment that is of concern in effectiveness measurement. On the other hand, materiel which is intended for close interaction with the threat in combat, depicted by the curve labeled "combat interaction—total" presents a high entropy challenge, poorly adapted to credible measurement because of the high degree of operational uncertainty. This is true throughout the developmental life cycle until use-disciplined employment doctrine is generated, either through field exercises or actual combat use. Examples of this type of materiel, generally tactical in nature,

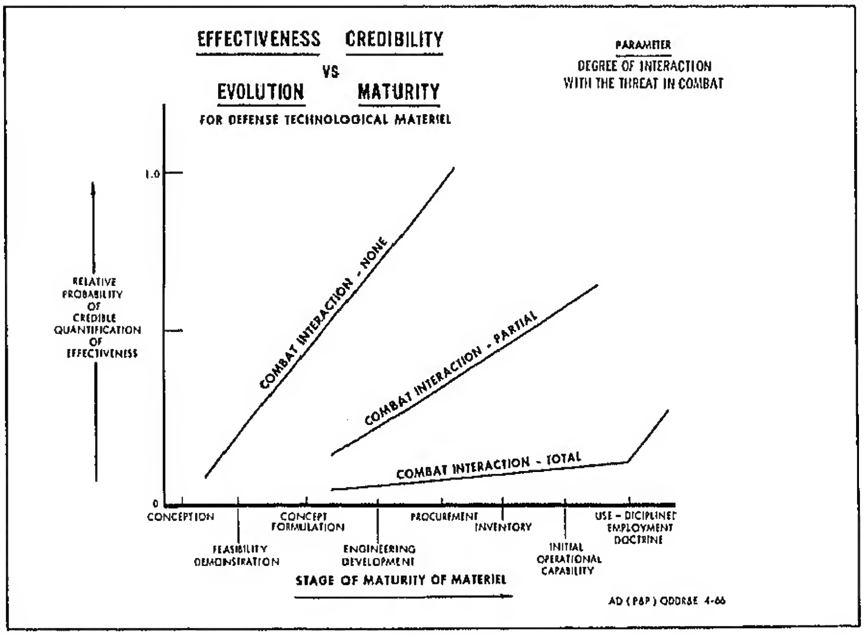


Figure 8.

might be the SAM-D or tactically configured V/STOL aircraft. The middle curve recognizes that the combat interaction spectrum is continuous and that materiel exists that will operate in varying mixes of these environment extremes. Certain offensive and defensive strategic materiel, for example, is developed to operate in this partial interaction environment.

It's important at this point to recognize that the accommodating characteristics of the man component of the man-machine relationship makes the system into which the analyst works a forgiving one. The combat soldier, airman, or sailor, because he has rational ingenuity and latent talent, will compensate for errors in judgment unwittingly made during the period that the operational characteristics of his materiel were being determined. He shoulders this compensation burden because options aren't available. Further, he shoulders it silently in many instances because he doesn't know what alternate operational capability he might have had. Here is a cost that is truly indeterminate and sublime in its immensity. The most cost-effective materiel, from the standpoint of the theoretical technologist or analyst, may in combat be imposing an intolerable cost or penalty upon the pilot, missileman, or combat soldier. The man-machine in combat is a forgiving system because the man has no alternative; his welfare depends in most cases on the machine. However, the cost in terms of reduced efficiency resulting from additional strain on the human organism, or from the need for greater proficiency, can be enormous. A most serious eventuality can result if the man's best efforts cannot close the operational gap between his materiel and the demands of his combat environment. Until the methodology of cost effectiveness has developed a method for coping with this form of cost, the cost-effectiveness technique applied to combat interacting materiel during the requirements definition phase must be recognized as incomplete and susceptible to potentially malignant error.

We have up to this point individually examined the three characteristics of materiel upon which is based the answer, "It depends," which was given in response to the question, "Can the effectiveness of R&D be measured?"

Figure 9 depicts orthogonally the matrix of the total mix of end-use oriented R&D materiel, considering these three characteristics. The x axis sets forth the spectrum of combat interaction, the y axis treats conceptual maturity and the z axis developmental maturity. By viewing this matrix, it's possible to visualize the parametric interrelationships, to identify the R&D materiel which is most susceptible to credible effectiveness quantification (area A), and to identify that R&D materiel which might, as we stated at the beginning, well suffer from any measurement attempt (area B). Again this is qualitative and not intended to develop sharp zones of distinction but is shown to focus attention upon what might be considered the permissive and forbidden areas.

With respect to this materiel categorized as forbidden to the numbers-oriented analyst, we might reflect on a possible logic derivative of some well chosen words provided by Charles Hitch. He wrote:

"The human mind has some great advantages over any machine if we think of them as rivals or alternatives. It has, by comparison, a capacious memory, which enables it to learn from experience. It has a remarkable facility for factoring out the important variables and suppressing the rest. These are the reasons human beings beat machines at chess or war games. But, on the side of analysis: First, it's wrong to look upon intuition and analysis or minds and machines as rivals or alternatives. Properly used, they complement each other. We have seen that every system analysis is shot through with intuition and judgment. Every decision that seems to be based on intuition is probably shot through with species of analysis."*

This statement might provide one key to the optimization of the operational characteristics of combat interaction weapons. If the human mind has great advantages over the machine, because it learns from experience and can factor out important variables, it would appear that one challenge then is to maintain the complementary relationship mentioned, and not permit the ascendency of the analytical machine over the mind. If decisions that seem to be based on intuition are indeed shot through with analysis, it might well follow that the superior quality of that underlying analysis derives from the advantage that the mind has in the first place, namely, capacious memory and ability to learn from experience and factor out important variables. It would seem imperative, therefore, to guard against straight-jacketing this superior analytical capability. Forced conformance of intuition and judgment to the unyielding demands of the machine could represent unwitting retrogression of the total analytical system. After all, if the judgment and intuition to which Mr. Hitch refers is the characteristic that enables the human mind to beat machines at war games, it may well be that that very judgment is the key to optimal characteristics of combat interaction materiel.

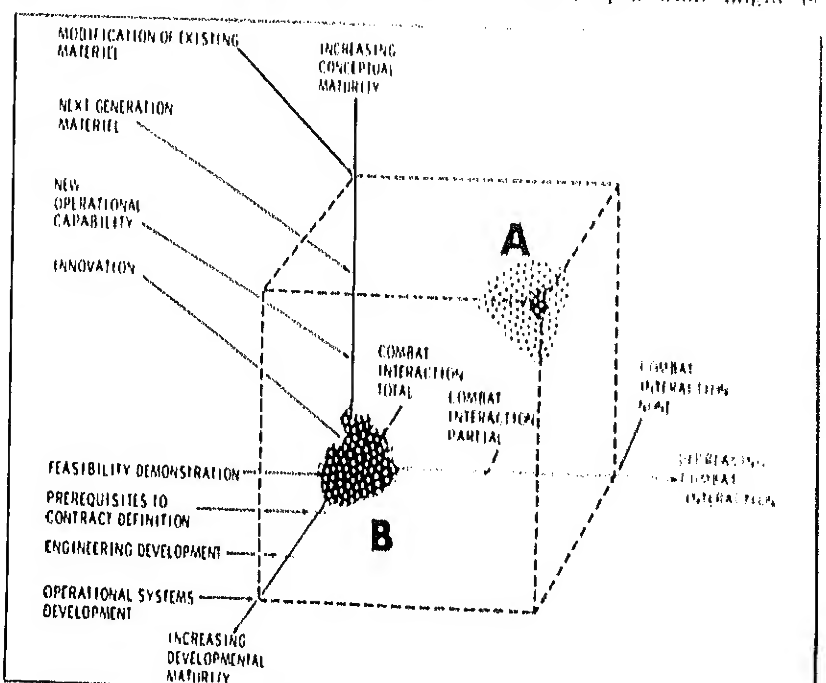


Figure 9.

*"*Analysis for Military Decision*," E. S. Quade, p. 21.

(*Continued on page* 21)

Briefed below are some events and projects within the Department of Defense which may be of interest to writers and editors. If further information on any of these topics is desired, please write to Chief, Magazine and Book Branch, Office of Assistant Secretary of Defense (Public Affairs), Washington, D. C., 20301.

NEW NAVY CRAFT THAT FLOAT ON AIR NOW IN VIETNAM

Three Navy craft that "float" on a cushion of air are in operation in Vietnam. Each of the high-speed patrol boats is powered by a single gas turbine engine which provides both lift and propulsion through a lift fan and an aircraft-type variable pitch propeller. The 39-foot craft can travel over water, swamp and flat land areas at speeds in excess of 50 knots while combat loaded. Each boat is manned by two officers and two enlisted men. They are taking part in the Navy's coastal surveillance operations in Vietnam.

AIR FORCE TESTS FAST SETTING POLYESTER FOR HELO LANDING SITES

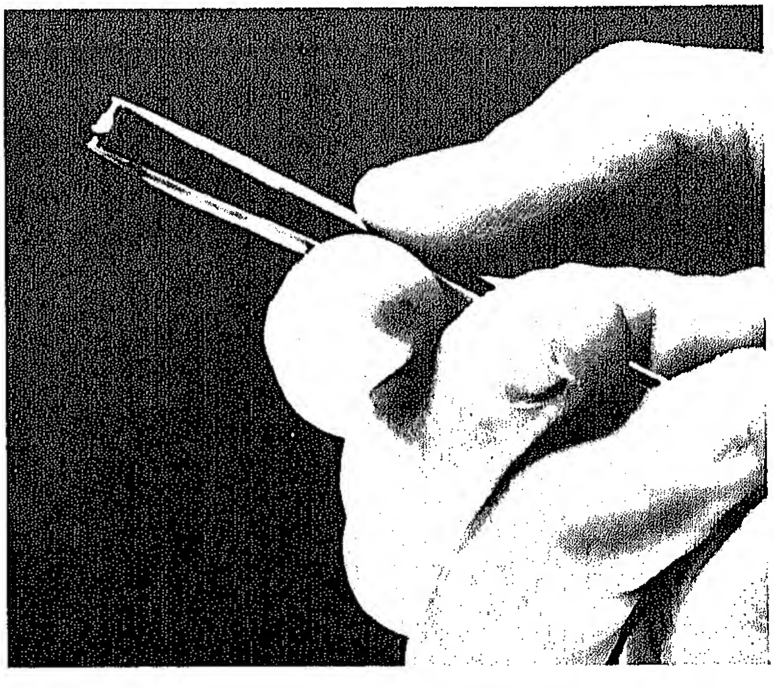
Rapid landing sites that can be ready to receive vertical/short takeoff and landing aircraft and helicopters in one and one-half hour are just around the corner. One of the materials under commercial development for the Air Force is a fast-setting polyester resin. In tests, a 16x32-foot shelter floor of the chlorinated polyester resin formulation reinforced with fiber glass was sprayed over soft, desert sand. Spraying was completed in 30 minutes and the floor, approximately one-fourth inch thick and weighing about two pounds per square foot, had hardened within one hour. The floor showed no damage or permanent deformation after it was tested successively with two automobiles weighing 3,600 pounds each, a 7,000-pound UH-1 helicopter with steel skids, a 9,000-pound fork lift, a 10,500-pound S-58 helicopter and a 17,500-pound fire truck. Additional tests will be conducted to measure shrinkage, cracking and fire resistance.

ADVANCED HYDROGEN GENERATOR UNDERGOES TESTS BY U.S. ARMY

The Army is currently testing an advanced hydrogen generator for use with hydrogen-air fuel cells. Weighing 460 pounds and occupying 18 cubic feet, the generator is expected to make possible, for the first time, a practical electric power system that combines very high efficiency and inexpensive liquid fuel. In operation, the generator uses slightly more than two quarts of fuel an hour to produce 140 cubic feet an hour of ultra-pure hydrogen, which can be used in practical fuel cells to produce 7,000 watts of DC electrical power. The generator itself requires only 325 watts. Five quarts of water an hour are consumed in the steam-reforming process of the generator. However, it can be supplied by water recovery from the fuel cell and the generator stack gas, thereby making the system practically self-sustaining.

ARMY DEVELOPS TINY YET RUGGED SIGNAL DEVICE

The Army has developed a radio-wave signal generator the size of a grain of rice. The essential material in the generator, gallium arsenide, is a speck invisible to the naked eye. Experiments so far have proven the device highly efficient with almost unprecedented signal strength output in comparison to electrical power input. The generator has unusual frequency ranges in the microwave and millimeter portions of the spectrum; tests have been pushed up to 40 gigacycles (one billion cycles per second). As a solid-state device, the signal generator is inherently rugged, long-lived and, in mass production, would be cheap to produce. Additionally, it is highly compatible with the microelectronic circuitry now being produced for a growing number of other electronic functions.



So small it requires tweezers for handling, this radio-wave generator, or oscillator, promises to supplant devices up to hundreds of times larger in some of the Army's future models of lightweight communications and radar equipment. The solid state generator's essential material, a speck of gallium arsenide invisible to the naked eye, is contained within the package held by the tweezers.

The Development of SAIMS

by

Col. Herbert Waldman, USAF
Dir. for Assets Management Systems
Office of Asst. Secretary of Defense (Comptroller)

The objectives, overall structure and development principles of the Resource Management Systems were addressed by Assistant Secretary of Defense (Comptroller) Robert N. Anthony during the DOD-National Security Industrial Association Advanced Planning Briefings for Industry and published in the April 1966 issue of the *Defense Industry Bulletin*. The structure of that system was identified in four areas (Chart I).

This article concentrates on further description of the effort to develop the Selected Acquisitions Information and Management System (SAIMS), which is one of the types identified therein and is concerned with:

> The management of the acquisition, utilization and disposition of capital assets, which is the process of getting the weapon and support systems of the quality and configuration we need, on schedule, and at lowest cost.

The Cost Information Reports (CIR) are one part of SAIMS, the Economic Information System (EIS) another. Initial efforts in both of these parts have been reviewed and approved by the Bureau of the Budget for implementation. The implementation of the new reports will result in phasing out existing reporting requirements as shown in Chart II.

Major systems design effort is also currently in process in the third part of SAIMS, which is concerned with performance measurement (Chart III). Work in the SAIMS area is currently being accomplished in the Directorate for Assets Management Systems under the Deputy Assistant Secretary of Defense (Management Systems Development) in the Office of the Assistant Secretary of Defense (Comptroller).

The objectives of SAIMS, which are common to all resource management systems intended for use by managers, are:

- To provide managers at all levels within DOD with information that will help them assure that resources are obtained and used effectively and efficiently in the accomplishment of DOD objectives.
- To provide information that is useful in the formulation of objectives and plans.
- To provide data to support program proposals and requests for funds.
- To provide a means of assuring compliance with statutes, agreements with Congressional committees and other requirements relating to resources emanating from outside DOD.

"It is generally recognized that a large number of information and management subsystems are available today for such use with varying degrees of efficiency. What is sought now is a unification of approach to provide the data needed by Defense management without the disproportionate diversion of resources to support the many required information flows.

In improving current efforts, SAIMS will specifically provide:

- Performance measurement data comparing resource outlays and actual progress against planned time schedules, planned costs and planned technical performance goals.
- Funds data for measuring and controlling the need for and the flow of funds.
- Data on costs of selected weapon systems and their major, defense components.
- Data for the measurement of the economic impact of Defense procurement.

Results will be achieved through a "systems" approach in development. The specific work program will ensure that what is developed is necessary, feasible, useable and implemented according to plan.

In developing an improved management control system, which is the technical synonym for performance measurement, the effort is being oriented throughout the process of management systems development to serve project managers' needs.

Defense management will benefit from these efforts by having:

- A uniform, integrated system for obtaining reliable, timely and comparable schedule, cost and technical performance data compared to plans and specifications, to improve planning, programming, budgeting, contract negotiating and, particularly, systems project management.
- A system which minimizes the impact upon the contractors' internal management and accounting systems and contract costs.
- A continuing source of essential information on which to base assessments of the economic impact of Defense contracts on employment, by

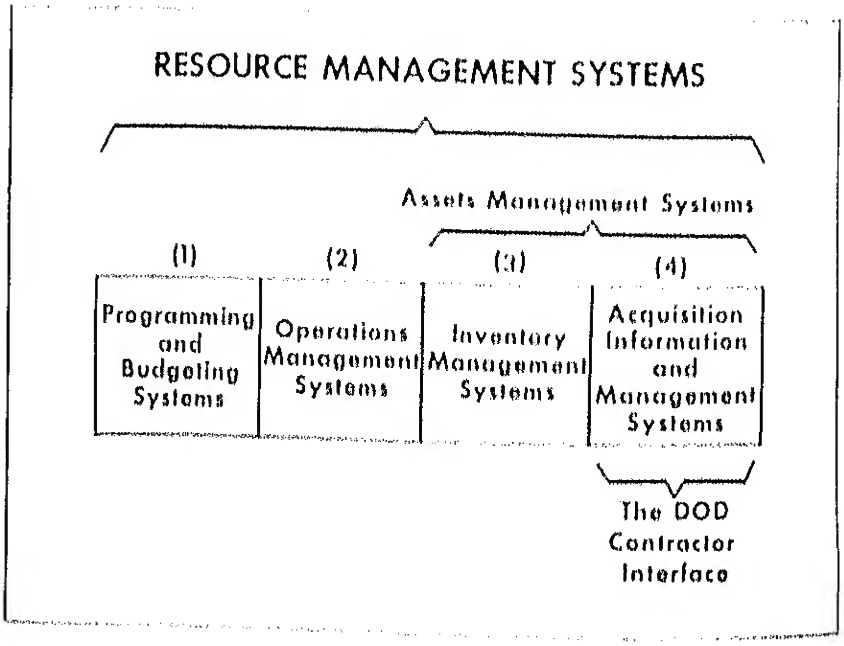


Chart I.

individual plans and local geographic area.

• A continuing evaluation of new approaches and innovations in the construction of management systems, with the goal of improving DOD management effectiveness and reducing management costs.

Current efforts are being devoted to an investigation of existing management systems procedures and data gathering systems concerned with cost, schedule and technical performance as a prelude to the design of data collection prototypes. The development of requirements for reporting funding information (Contract Funds Status Report—CFSR) is the remaining part of this current systems design effort.

Industry comments and recommendations for improving the initial approach in designing CFSR have been received, are being evaluated, and will result in a means of collecting data about estimates of change in contract funding requirements to support financial management. Positive collaboration with industry will continue so that responsible criticism becomes an explicit element of input in future management systems design.

PLANNED PHASEOUT OF DOD REPORTING REQUIREMENTS

Existing Reports Current	Proposed Replacement	Plants Affected	Effective Date
DD Form 1401 Plant Data	Format 1 Plantwide Economic Report	All	Upon BOB Approval
DD Form 1401-1 Direct Labor Data	Cost Information Reports	Producers of Elements of Aircraft Missile & Space Systems	a. New contracts-CIR, when established, will be used for Selected Acquisition, after OSD approval.
DD Form 1401-2 Completed Unit Data			b. Current contracts-DCPR Series continues through contract completion unless agreement is reached between Government and Industry representatives for replacement by CIR.
DD Form 1401-3 Flowtime and Release Dates		All Other	a. New contracts-CIR, when established, may be used to the extent agreement is reached between Government and Industry representatives expressed in a contract.
DD Form 1177 Cost Incurred on Contract			b. Current contracts-DCPR series continues through contract completion unless agreement is reached between Government and Industry representatives for replacement by CIR.

Chart II.

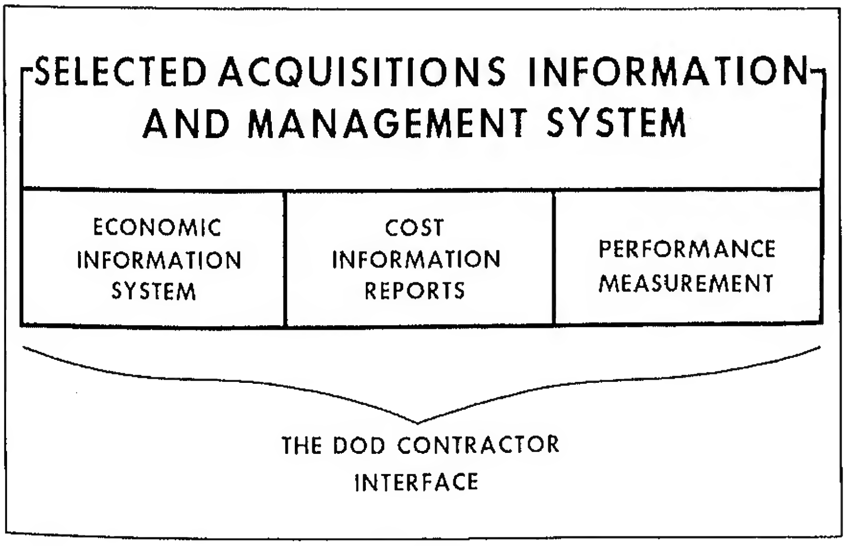


Chart III.

New Weather Radars Slated For S.E. Asia

Powerful new long-range weather radars, capable of giving advance knowledge of rainfall and other weather conditions 200 miles away and up to 15 miles high, are being procured by the Air Force for use in Southeast Asia.

Developed for the U.S. Weather Bureau by the Raytheon Co. specifically for weather detection and analysis, three of the radars will be installed by the Air Force at selected locations in Southeast Asia

The radars will be positioned in a triangle to provide maximum coverage of meteorological phenomena. The storm-detecting equipment will keep an electronic round-the-clock track of weather in a 200,000-square-mile area.

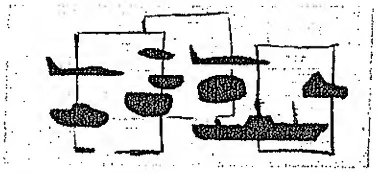
The 433L System Program Office at the Air Force Systems Command's Electronic Systems Division, L.G. Hanscom Field, Mass., is responsible for procuring and installing the high priority radars. Raytheon Co. is prime contractor for the system.

Problem Mongers, Solution Mongers

(*Continued from page* 18)

In closing it's worth noting that a growing number of statesmen in the scientific and technological community have been expressing concern over the dangers of technological complacency and the need for innovation encouragement. This discussion of problem mongers, solution mongers and operational uncertainty offers the following postulate for consideration, namely, one of the best ways to strangulate innovation is to attempt to rigorously quantify the effectiveness of innovative concepts.

Attempts to quantify the unquantifiable, in the interests of satisfying the demands of an unyielding methodology, is a potentially stifling practice that could cause irreparable damage to our technological supremacy and the consequent ability to defend ourselves during the challenging decades ahead. At the other extreme, neglect of the quantifiable economics of defense materiel, in the interests of cost-free choices of action, is also a dangerous practice that could cause irreparable damage to our economic solvency and the consequent fiscal stability necessary during the challenging decades ahead. The prudent course lies between those two extremes. Enlightened understanding, on the part of the military, technical and economic professional, of the limits and constraints of their regions of competency can contribute greatly toward assuring that this judicious course is maintained.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of May 1966:

DEFENSE SUPPLY AGENCY

1—**Crowley Industrial Bag Co.**, Crowley, La. $1,406,400. 55,000 packages of osnaburg sandbags (100 bags to a package). Crowley. Defense General Supply Center, Richmond, Va.

—**Cavalier Bag Co.**, Lumberton, N.C. $1,901,105. 10,000 packages of burlap sandbags and 70,000 packages of osnaburg sandbags (100 bags to a package). Lumberton. Defense General Supply Center, Richmond, Va.

—**Anderson Tank & Mfg. Co.**, Flint, Mich. $2,872,100. 7,000 metal shipping boxes. Flint. Defense General Supply Center, Richmond, Va.

—**Putnam Mills**, New York City. $1,097,250. 627,000 yards of cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

—**Bates Fabrics**, New York City. $3,285,000. 2,000,000 yards of cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

—**Prestex, Inc.**, New York City. $1,029,000. 600,000 yards of cotton oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

—**J. P. Stevens & Co.**, New York City. $4,955,250. 1,075,000 yards of wool gabardine cloth. New York City. Defense Personnel Support Center, Philadelphia.

—**Bruce Products, Inc.**, Eatontown, N.J. $1,974,469. 167,310 men's wet-weather parkas. Eatontown. Defense Personnel Support Center, Philadelphia.

2—**J. P. Stevens & Co.**, New York City. $3,840,850. 3,000,000 yards of combed cotton twill cloth and 972,000 yards of carded cotton twill cloth. New York City. Defense Personnel Support Center, Philadelphia.

—**Cone Mills Corp.**, Greensboro, N.C. $1,130,189. 1,784,524 yards of carded cotton twill cloth. Greensboro. Defense Personnel Support Center, Philadelphia.

6—**Centre Mfg. Co.**, Centre, Ala. $1,071,000. 100,000 men's lightweight raincoats. Centre. Defense Personnel Support Center, Philadelphia.

—**Bruce Products**, Eatontown, N.J. $1,369,800. 110,000 men's lightweight raincoats. Eatontown. Defense Personnel Support Center, Philadelphia.

—**U. S. Bedding Co.**, St. Paul, Minn. $1,341,825. 52,500 bunk beds. St. Paul. Defense General Supply Center, Richmond, Va.

—**Republic Steel Corp.**, Youngstown, Ohio. $8,895,200. 40,000 bundles of steel landing mats. Youngstown. Defense Construction Supply Center, Columbus, Ohio.

7—**Eastman Kodak Co.**, Rochester, N.Y. $1,366,914. 9,300 rolls of aerial photographic film. Defense General Supply Center, Richmond, Va.

—**J. P. Stevens & Co. Inc.** New York City. $1,621,659. 1,875,000 yds. of water repellent cotton cloth. New York City. Defense Personnel Support Center, Philadelphia.

J. F. McElwaine Co., Nashua, N.H. $1,544,000. 200,000 pairs of shoes. Nashua. Defense Personnel Support Center, Philadelphia.

—**Norrwock Shoe Co.**, Norridgewock, Maine. $2,008,109. Norridgewock. Defense Personnel Support Center, Philadelphia.

—**Genesco, Inc.**, Nashville, Tenn. $1,260,000. 150,000 pairs of shoes. Nashville. Defense Personnel Support Center, Philadelphia.

8—**Standard Oil Co. (Kentucky)**, Louisville, Ky. $2,826,295. 16,738,000 gallons of motor gasoline and 4,885,600 gallons of distillates. Defense Fuel Supply Center, Alexandria, Va.

—**Gulf Oil Corp.**, Houston, Tex. $1,426,919. 3,700,000 gallons of motor gasoline, 7,000,000 gallons of distillates, and 2,350,000 gallons of residual fuels. Defense Fuel Supply Center, Alexandria, Va.

—**Lockheed Aircraft Corp.**, Marietta, Ga. $1,453,680. 1,425 cargo trailers. Defense General Supply Center, Richmond, Va.

9—**Standard Oil Co. of Calif.**, San Francisco. $1,810,686. 12,691,260 gallons of RF-1 rocket fuel. Defense Fuel Supply Center, Alexandria, Va.

10—**Deering Milliken, Inc.**, New York City. $2,677,530. 599,000 yds of wool gabardine cloth. Defense Personnel Support Center, Philadelphia.

—**Interstate Mfg. Co. Inc.**, Hudson, Mass. $1,089,280. 92,000 pairs of men's wet-weather, coated nylon overalls. Defense Personnel Support Center, Philadelphia.

—**Payne & Associates, Inc.**, Raleigh, N.C. $1,216,369. 100,108 pairs of men's wet-weather coated nylon overalls. Defense Personnel Support Center, Philadelphia.

—**Superior Sleeprite Corp.**, Chicago. $1,201,830. 48,500 steel bunk beds. Defense General Supply Center, Richmond, Va.

13—**Shell Oil Co.**, New York City. $1,644,461. Petroleum services & products. Defense Fuel Supply Center, Alexandria, Va.

14—**Continental Motors Corp.**, Muskegon, Mich. $1,017,159. 3,985 cylinder assemblies. Defense Construction Supply Center, Columbus, Ohio.

—**LaCrosse Garment Mfg. Co.**, La Crosse, Wis. $1,150,062. 425,949 nylon insect bars. Defense Personnel Support Center, Philadelphia.

—**Boothe Packing Co.**, Modesto, Calif. $3,381,811. 4,400,008 cases of individual combat meals. Defense Personnel Support Center, Philadelphia.

—**Usibelli Coal Mine, Inc.**, Fairbanks, Alaska. $1,227,022. 208,500 tons of sub-bituminous coal. Defense Fuel Supply Center, Alexandria, Va.

—**Vitro Minerals Corp.**, New York City. $1,219,725. 208,500 tons of sub-bituminous coal. Defense Fuel Supply Center, Alexandria, Va.

15—**Dow Chemical Co.**, Midland, Mich. $1,943,280. 256,000 gallons of herbicide. Defense General Supply Center, Richmond, Va.

—**Putnam Mills**, New York City. $1,085,540. 2,059,496 yds of cotton duck cloth. Defense Personnel Support Center, Philadelphia.

—**Kayser Roth Corp.**, Woodbury, Tenn. $1,017,216. 198,480 men's pajama trousers & 135,600 men's pajama coats, both of cotton flannel. Defense Personnel Support Center, Philadelphia.

—**Standard Oil Co. of Calif.** San Francisco. $2,285,769. 639,600 gallons of gasoline; 84,000 gallons of diesel fuel; 10,836,201 gallons of fuel oil; & 16,105 gallons of solvent. Defense Fuel Supply Center, Alexandria, Va.

—**Evan Jones Coal Co.**, San Francisco. $2,529,450. 251,000 tons of bituminous coal. Defense Fuel Supply Center, Alexandria, Va.

16—**Sinclair Refining Co.**, New York City. $1,858,500. 12,600,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va.

—**Phillips Petroleum Co.**, Bartlesville, Okla. $1,585,332. 11,340,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va.

—**Cities Service Oil Co.**, New York City. $1,251,776. 8,400,000 gallons of grade 115/145 aviation gasoline. Defense Fuel Supply Center, Alexandria, Va.

—**Page Airways, Inc.**, $1,060,000. Operation & maintenance of the Defense Industrial Plant Equipment Facility at Atchison, Kan. Defense Industrial Plant Equipment Center, Memphis, Tenn.

17—**Southern Athletic Co.**, Knoxville, Tenn. $3,306,585. 556,380 coated nylon twill ponchos. Defense Personnel Support Center, Philadelphia.

20—**Charles Pfizer and Co.**, New York City. $1,632,121. 380,448 bottles of oxytetracycline tablets. Defense Personnel Support Center, Philadelphia.

—**West Point Pepperell Inc.**, New York City. (1) $1,143,093. 815,765 yds of mildew-resistant, water-repellent cotton duck cloth. (2) $1,894,816. 1,450,909 linear yds of vat dyed, mildew-resistant, water-repellent cotton duck cloth. Defense Personnel Support Center, Philadelphia.

21—**Pascoe Steel Corp.**, Pomona, Calif. $1,011,949. 213 Steel prefabricated bldgs. Defense Construction Supply Center, Colu[mbus,] Ohio.

—**Oscar Mayer & Co.**, Madison, Wis. $1[,...]518. 527,416 twenty-two ounce ca[ns] pre-fried sliced bacon. Defense Pers[onnel] Support Center, Philadelphia.

—**Baird & McGuire, Inc.**, Holbrook, [Mass.] $1,153,309. 4,315 drums (55-gallon) malathion insecticide. Defense Ge[neral] Supply Center, Richmond, Va.

—**J. M. Wood Mfg. Co., Inc.**, Waco, [Tex.] $3,141,500. 1,525,000 pairs of men's c[otton] sateen trousers. Defense Personnel [Sup]port Center, Philadelphia.

—**Twinco Products Inc.**, San Fernando, C[alif.] $1,868,400. 1,080,000 pairs of men's c[otton] sateen trousers. Defense Personnel [Sup]port Center, Philadelphia.

—**Winfield Mfg. Co. Inc.**, Winfield, Ala. [$1,]344,000. 800,000 pairs of men's c[otton] sateen trousers. Defense Personnel Sup[port] Center, Philadelphia.

22—**Gentex Corp.**, Carbondale, Pa. $1,914[,...] 22,098 flying helmets. Defense Perso[nnel] Support Center, Philadelphia.

—**Putnam Mills**, New York City. $1,847[,...] 742,000 yds of ballistic nylon cloth. [De]fense Personnel Support Center, Phi[la]delphia.

—**Calloway Mills**, La Grange, Ga. $1,7[..,]100. 840,000 yds of ballistic nylon cl[oth.] Defense Presonnel Support Center, Phi[la]delphia.

23—**Valley Metallurgical Processing Co.**, Ess[ex,] Conn. $3,412,304. 4,399,000 lbs of mag[ne]sium powder. Defense General Supp[ly] Center, Richmond, Va.

—**Randolph Mfg. Co., Inc.**, Randolph, Ma[ss.] $2,927,924. 225,572 pairs of tropical co[m]bat boots. Defense Personnel Support Ce[n]ter, Philadelphia.

—**Hi-Pals Footwear Inc.**, Waynesville, N.C. $1,744,500. 150,000 pairs of tropical comb[at] boots. Defense Personnel Support Cente[r,] Philadelphia.

—**Bata Shoe Co., Inc.**, Belcamp, Md. $1,91[.,]800. 360,000 pairs of tropical combat bo[ots.] Defense Personnel Support Center, Phil[a]delphia.

—**Safety First Shoe Co.**, Nashville, Tenn. $5,027,904. 448,500 pairs of tropical comb[at] boots. Defense Personnel Support Center, Philadelphia.

—**Endicott Johnson Corp.**, Endicott, N.Y. $1,888,320. 168,000 pairs of tropical comb[at] boots. Defense Personnel Support Center, Philadelphia.

—**Wellco Shoe Div. of Wellco Ro-Search Industries, Inc.**, Waynesville, N.C. $1,153,[...] 91,000 pairs of tropical combat boots. Defense Personnel Support Center, Philadelphia.

—**Guilford Mills**, Greensboro, N.C. $2,805,[...] 10,540,000 yds of knitted nylon cl[oth.] Greensboro. Defense Personnel Support Center, Philadelphia.

—**Gilbraltar Fabrics, Inc.**, Brooklyn, N.Y. $1,062,035. 4,000,000 yds of knitted ny[lon] cloth. Defense Personnel Support Center, Philadelphia.

24—**Ansul Co.**, Marinette, Wis. $2,034,[...] 400,000 gallons of herbicide. Defense General Supply Center, Richmond, Va.

—**Cross Country Clothes, Inc.**, Northampton, Pa. $1,061,178. 41,115 men's tropical wo[ol] coats. Defense Personnel Support Center, Philadelphia.

—**Humble Oil & Refining Co.**, Houston, Tex. $3,443,370. 35,490,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Texaco Inc.**, New York City. $3,002,[...] 30,240,000 gallons of grade JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Coastal States Petrochemical Co.**, Houston, Tex. $2,619,749. 28,371,000 gallons of grade JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Continental Oil Co.**, Houston, Tex. $1,2[..,]700. 12,000,000 gallons of grade JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

27—**Centre Mfg. Co.**, Centre, Ala. $1,121,655. 100,520 men's nylon-coated raincoats. Defense Personnel Support Center, Philadelphia.

—Sprapak Chemicals, Inc., Brooklyn, N.Y. $1,470,300. 2,500,000 cans of insecticide. Defense General Supply Center, Richmond, Va.

28—Winthrop Laboratories, New York City. $1,602,600. Quantities of primaquine and chloroquine products. Defense Personnel Support Center, Philadelphia.

—Abate Clothing, Inc., Atlantic City, N.J. $1,213,800. 60,000 men's wool serge coats. Defense Personnel Support Center, Philadelphia.

—B. G. Colton Textiles, New York City. $3,497,000. 2,000,000 yds of wind resistant cotton & nylon sateen cloth. Defense Personnel Support Center, Philadelphia.

—Erwin Mills, New York City. $1,626,100. 1,125,000 yds of wind resistant cotton and nylon sateen cloth. Defense Personnel Support Center, Philadelphia.

—Eastman Kodak Co., Rochester, N.Y. $1,008,440. 13,600 rolls of aerial duplicating film. Defense General Supply Center, Richmond, Va.

29—Weathervane Outerwear Corp., New York City. $3,853,677. 422,070 camouflage poncho liners. Defense Personnel Support Center, Philadelphia.

—Hunter Outdoor Products, Inc., Long Island, N.Y. $1,439,019. 659,780 duffel bags. Defense Personnel Support Center, Philadelphia.

—The Defense Personnel Support Center, Philadelphia, has awarded the following contracts for body armor vests.

L. W. Foster Sportswear Co., Philadelphia. $1,327,995. 76,000 vests.

Kings Point Industries, New York City, $1,812,000. 100,000 vests.

Martin Lane Co., Elizabeth, N.J. $1,367,098. 77,150 vests.

—Morris Bros., Inc., New York City. $1,641,915. 900,000 white cotton bed sheets. Defense Personnel Support Center, Philadelphia.

—Springs Cotton Mills, New York City. $1,454,880. 800,000 white cotton bed sheets. Defense Personnel Support Center, Philadelphia.

—B. G. Colton Textiles, New York City. $1,478,932. 1,123,250 yds of wind resistant cotton oxford cloth. Defense Personnel Support Center, Philadelphia.

—C. M. London Co., New York City. $1,080,104. 820,000 yds of wind resistant cotton oxford cloth. Defense Personnel Support Center, Philadelphia.

—Cone Mills Corp., Greensboro, N.C. $1,091,481. 1,300,888 yds of cotton polyester twill cloth. Defense Personnel Support Center, Philadelphia.

—Texaco Inc., New York City. $2,632,128. 20,160,000 gallons of grade JP 4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—Gulf Oil Corp., New York City. $3,124,380. 33,600,000 gallons of grade JP 5 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

30—Albert Turner & Co. New York City. $1,086,813. 40,050 men's green wool serge coats with belts. Defense Personnel Support Center, Philadelphia.

—Phillips Petroleum Co., Bartlesville, Okla. $1,022,950. 10,250,000 gallons of grade JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—Stauffer Chemical Co., New York City. $1,731,016. 428,461 gallons of aircraft turbine engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va.

ARMY

1—I.B.M., White Plains, N.Y. $3,500,000. Classified electronics equipment. Poughkeepsie, N.Y. Army Electronics Command, Fort Monmouth, N.J.

—List & Clark Construction Co., Overland Park, Kan. $2,557,168. Work on the Missouri River agricultural levees. Near St. Joseph, Mo. Engineer Dist., Kansas City, Mo.

2—Firestone Tire & Rubber Co., Akron, Ohio. $2,834,595. Rubber track shoe assemblies for the M60 combat vehicle. Noblesville, Ind. Army Tank Automotive Center, Warren, Mich.

—Southern Airways of Texas, Mineral Wells, Tex. $14,404,255. Training of Army helicopter pilots and maintenance of aircraft at Fort Wolters, Tex. Purchasing and Contracting Office, Fort Wolters, Tex.

—List & Clark Construction Co., Overland Park, Kan. $2,451,947. Construction work on the Stockton, Missouri, Project. Stockton. Engineer Dist., Kansas City, Mo.

—Bell Helicopter Co., Fort Worth, Tex. $9,718,190. UH-1 transmission assemblies. $1,142,676. UH-1 main rotor blade assemblies. Fort Worth. Army Aviation Materiel Command, St. Louis.

Continental Aviation & Engineering Corp., Detroit. $2,065,411. Production and inspection engineering services for 2½-ton and 5-ton truck engines. Detroit. General Purpose Vehicle Project Manager, Army Mobility Command, Warren, Mich.

Philco Corp., Philadelphia. $4,000,000. Classified electronic equipment. Philadelphia. Army Electronics Command, Fort Monmouth, N.J.

Laboratory for Electronics, Inc., Boston, Mass. $8,714,261. Aircraft position-fixing navigation sets. Danvers, Mass. Army Electronics Command, Philadelphia.

Matich Bros., Colton, Calif. $1,586,290. Strengthening of airfield pavements at Norton AFB, Calif. Engineer Dist., Los Angeles.

6 Farrell Construction Co., Memphis, Tenn. $1,972,868. Work on the West Point Reservoir, Alabama, Project. West Point, Ga. Engineer Dist., Savannah, Ga.

Eastern Canvas Products, Inc., Haverhill, Mass. $4,896,630. Protective hoods. Haverhill. Edgewood Arsenal, Md.

Kaiser Jeep Corp., Toledo, Ohio, $3,227,638. M 39 trucks with Government furnished, multi-fuel engines. Toledo. General Purpose Vehicle Project Manager, Army Mobility Center, Warren, Mich.

Hallmark Industries, Patterson, Calif., $4,672,000. Fabrication of 3,000 lightweight aluminum hut kits. Patterson. ACS G4, U.S. Army, Hawaii.

7 Douglas & Lomason Co., Columbus, Ga. $1,291,263. Columbus. Ordnance items. Ammunition Procurement & Supply Agency, Joliet, Ill.

Philco Corp., Newport Beach, Calif. $1,406,906. Shillelagh spare parts. Newport Beach. Southwest Procurement Agency, Pasadena, Calif.

8 Collins Radio Co., Dallas, Tex. $3,250,000. High-frequency, single side-band, airborne radio sets. Dallas. Army Electronics Command, Fort Monmouth, N.J.

Olin Mathieson Chemical Corp., New Haven Conn. $1,467,600. Shoulder stocks for M14 rifles. Springfield Armory, Springfield, Mass.

Brunswick Corp., Marion, Va. $1,637,310. 35mm cartridge launchers. Parkersburg, Pa. and Marion. Edgewood Arsenal, Md.

F. D. Rich Co., Inc. Stamford, Conn. $3,306,063. Expansion of water supply, electrical distribution and telephone systems at the U.S. Military Academy, West Point, N.Y. Engineer Dist., New York N.Y.

Troup Brothers, Inc., Coral Gables, Fla. $2,837,053. Work on Canal 54 of the Central and Southern Florida Flood Control Project, Melbourne, Fla. Engineer Dist., Jacksonville, Fla.

9 Maremont Corp., Saco, Maine. $1,471,022. M60 machine guns with barrel and bipod assemblies. Army Weapons Command, Rock Island Arsenal, Rock Island, Ill.

International Harvester Co., Melrose Park, Ill. $3,141,160. 70 full-tracked tractors for the Navy. Army Mobility Equipment Center, St. Louis.

Pace Corp., Memphis, Tenn. $1,627,732. 105mm canisters. Edgewood Arsenal, Md.

Universal Terminal & Stevedoring Corp., New York City. $13,898,063. Stevedoring services at the Military Ocean Terminal, Bayonne, N.J. Military Traffic Management and Terminal Services, Brooklyn, N.Y.

10 U.S. Rubber Co., Mishawaka, Ind. $1,818,520. Body armor. Army Natick Laboratories, Natick, Mass.

—Norton Co., Worcester, Mass. $1,207,680. Body armor. Army Natick Laboratories, Natick, Mass.

—Chemical Compounding Corp., Jersey City, N.J. $1,144,093. Decontaminating & reimpregnating kits. Edgewood Arsenal, Md.

—Scovill Mfg. Co., Waterbury, Conn. $1,072,811. Modification to an existing contract for bomb components. Ammunition Procurement & Supply Agency, Joliet, Ill.

—AVCO Corp., Stratford, Conn. $2,064,081. Modification kits in support of the T53 engine for UH-1 aircraft. Army Aviation Materiel Command, St. Louis.

—Fullerton Construction Co., Sacramento, Calif. $1,176,000. Construction of an academic bldg. complex at the Defense Language Institute, Presidio of Monterey, Calif. Engineer Dist. Sacramento, Calif.

—Dravo Corp., Pittsburgh, Pa. $3,616,730. Manufacture & delivery of tainter gates with hoists & other appurtenances, for locks & dams on the Arkansas River Navigation Project. Engineer Dist., Little Rock, Ark.

—Missouri River Constructors, Inc., Dallas, Tex. $1,267,926. Work on the Mississippi River & Tributaries (Flood Control) Project. Chicot County, Ark. Engineer Dist., Vicksburg, Miss.

—Martin K. Eby Construction Co., Wichita, Kan. $2,809,370. De Gray Dam & Reservoir, Caddo River, Arkansas Project. Clark County Ark. Engineer Dist., Vicksburg, Miss.

—AVCO Corp., Stratford, Conn. $1,756,440. T53 L 15 aircraft engines & special tooling. Army Aviation Materiel Command, St. Louis.

13 Construction Machinery Co., Waterloo, Iowa. $1,129,700. 286 concrete mixers. Army Mobility Equipment Center, St. Louis.

—Federal Cartridge Corp., Minneapolis, Minn. $6,833,031. 5.56mm ammunition, and for operation and maintenance activities at the Twin Cities Army Ammunition Plant, New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

Sperry Rand Corp., Salt Lake City, Utah, $1,131,138. Supplies & services to modify Sergeant missile components. Northwest Procurement Agency, Oakland, Calif.

14—Stewart & Stevenson Services, Inc., Houston, Tex. $2,787,396. 400-cycle AC generator sets. Army Mobility Equipment Center, St. Louis.

—General Motors, Cleveland, Ohio. $8,427,943. 155mm medium, self-propelled howitzer vehicles (M109). Cleveland. Army Weapons Command, Rock Island, Ill.

—Ward La France Truck Corp., Elmira Heights, N.Y. $1,289,199. 149 firefighting Trucks. Army Mobility Equipment Center, St. Louis.

—R.C.A., Burlington, Mass. $6,011,000. Research and development effort, data research, design, documentation, fabrication & test of the land Combat Support Systems (Shillelagh, Lance & Tow missile systems). Army Missile Command, Huntsville, Ala.

15 Northrop-Carolina, Inc., Asheville, N.C. $1,750,375. Chemicals. Swannanoa, N.C. Edgewood Arsenal, Md.

American Hoist & Derrick Co., St. Paul, Minn. $7,054,985. 262 rough terrain, air transportable wheel-mounted cranes. Fort Wayne, Ind. Army Mobility Equipment Center, St. Louis.

—Bethlehem Steel Corp., Bethlehem, Pa. $1,500,000. Forging tubes for 175mm guns (M113). Watervliet Arsenal, N.Y.

General Steel Tank Co., Reidsville, N. C. $1,562,664. 80 portable fuel systems. Army Mobility Equipment Center, St. Louis.

Raytheon Co., Lexington, Mass. $4,500,000. Research & development work on the improved Hawk missile system. Bedford, Mass. Army Missile Command, Huntsville, Ala.

General Electric, Burlington, Vt. $2,148,014. 7.62mm aircraft machine guns and armament pods (GAU2B/A and XM18). Army Weapons Command, Rock Island Arsenal, Rock Island, Ill.

—TKU Construction Inc., Honolulu, Hawaii. $3,501,485. Construction of general purpose and humidity controlled warehouses; and for relocation of existing buildings at Machinato Service Area, Okinawa. Engineer Dist., Okinawa.

—Hughes Aircraft, Fullerton, Calif. $2,007,539. Two satellite communication terminals. (AN/MSC-46). Fullerton. Army Electronics Command, Fort Monmouth, N.J.

16 Mine Safety Appliances Co., Pittsburgh, Pa. $2,474,622. Filter elements for protective field masks. Esmond, R.I. Edgewood Arsenal, Md.

—General Electric, Syracuse, N.Y. $1,111,581. Modification of two radar sets (AN/MPQ/ 4A). Syracuse. Army Electronics Command, Fort Monmouth, N.J.

—LTV Corp., Warren, Mich. $1,205,000. Long lead time facilities for the Lance missile system. Michigan Army Missile Plant, Sterling, Mich. Army Mobility Equipment Center, Warren, Mich.

—Bernard McNenamy Contractor, Inc., St. Charles, Mo. $1,577,000. Kaskaskia River Navigation Project, Ill. Between Baldwin & New Athens, Ill. Engineer Dist., St. Louis.

—Norris Thermador Corp., Los Angeles. $1,355,127. 81mm projectiles. Southwest Procurement Agency, Pasadena, Calif.

—Litton Systems Inc., Van Nuys, Calif. $2,150,184. Scientific and technical effort in support of FY 67 combat development

experimentation. Fort Ord, Calif. Northwest Procurement Agency, Oakland, Calif.

17—Vinnell Corp., Alhambra, Calif. (1) A $2,728,708. Modification to a contract for design, procurement, and construction of five electrical land distribution systems. Los Angeles (40%) and remainder in South Vietnam. (2) A $3,925,000. Refitting of five T 2 tankers as power ships for South Vietnam. Army Mobility Equipment Center, St. Louis.

Standard Container, Inc., Montclair, N.J. $1,357,987. Ammunition boxes (M2A1). Homerville, Ga. Frankford Arsenal, Philadephia.

—Olin Mathieson Chemical Corp., East Alton, Ill. $1,196,587. 5.56mm cartridges. Frankford Arsenal, Philadelphia.

—Olin Mathieson Chemical Corp., New Haven Conn. $7,990,227. 7.62mm cartridges. Frankford Arsenal, Philadelphia.

—Colts Inc., Hartford, Conn. $29,035,408. XM-16E1 rifles. Army Weapons Command, Rock Island Arsenal, Rock Island, Ill.

—Schiller-Pfeiffer Machine Works, Inc. Southampton, Pa. $3,418,700. 152mm high explosive, anti-tank projectile assemblies. Picatinny Arsenal, Dover, N.J.

—Honeywell Inc., Hopkins, Minn. $2,781,392. 40mm cartridge fuzes. New Brighton, Minn. Ammunition Procurement and Supply Agency, Joliet, Ill.

—Chrysler Corp., Warren, Mich. $19,647,460. 789 rough terrain, fork lift trucks. Warren. Army Mobility Equipment Center, St. Louis.

20—Remington Arms Co., Inc., Bridgeport, Conn. $22,214,882. Small arms ammunition. Lake City Army Ammunition Plant, Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

21—Whirlpool Corp., Evansville, Ind. $2,159,468. Metal parts for 105-mm projectiles. Evansville. Picatinny Arsenal, Dover, N.J.

—Olin Mathieson Chemical Corp., New York City. $13,798,382. Propellant charges for artillery ammunition, and for operation and maintenance activities at the Army Ammunition Plant, Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Consolidated Diesel Electric Co., Stamford, Conn. $1,649,830. 10-ton tractor trucks. Schenectady, N.Y. Army Tank Automotive Center, Warren, Mich.

—Boeing Co., Morton, Pa. $8,000,000. CH-47 helicopter product improvement program. Morton. Army Aviation Materiel Command, St. Louis.

—Bulova Watch Co., Flushing, N.Y. $1,113,961. Development of the XM552, 30mm high explosive dual purpose cartridge. Flushing. Picatinny Arsenal, Dover, N.J.

—LeTourneau-Westinghouse Co., Peoria, Ill. $3,671,972. 260 motorized road graders. Indianoplis, Ind. Army Mobility Equipment Center, St. Louis.

—Olin Mathieson Chemical Corp., New Haven, Conn. $2,248,000. Loading, assembling, packing 20mm cartridges. La Porte, Ind. Frankford Arsenal, Philadelphia.

—Hawthorne Aviation, Fort Sill, Okla. $1,810,027. Aircraft maintenance & related services in support of the U.S. Army Aviation Test Board, Cairns Army Airfield, Fort Rucker, Ala. Aberdeen Proving Grounds, Md.

—Iowa Mfg. Co., Cedar Rapids, Iowa. $1,388,754. 13 semi-trailer mounted crushing & screening plants. Cedar Rapids. Army Mobility Equipment Center, St. Louis.

—Northrop Corp., Anaheim, Calif. $1,040,984. 106mm projectiles. Anaheim. Picatinny Arsenal, Dover, N.J.

—Bell Helicopter Co., Fort Worth, Tex. $2,927,394. TH-13T helicopters (basic instrument trainers). Fort Worth. Army Aviation Command, St. Louis.

22—Cabot Corp., Pampa, Tex. $1,226,293. Tube forgings for the 105mm (M68). Kingsmill, Tex. Watervliet Arsenal, N.Y.

—Wahiawa Builders, Inc., Wahiawa, Oahu, Hawaii. $1,024,050. Photo laboratory at Hickham AFB, Hawaii. Engineer Dist., Honolulu, Hawaii.

—Kaiser Jeep Corp., Toledo, Ohio. $1,138,830. 3,451 engine assemblies for ¼-ton trucks. Toledo. Army Tank Automotive Center, Warren, Mich.

—Kaiser Jeep Corp., Toledo, Ohio. $25,609,870. 1¼-ton trucks. Toledo. General Purpose Vehicle Manager, Army Mobility Equipment Center, Warren, Mich.

—Colt's Inc., Hartford, Conn. $1,835,804. XM16E1 and M16 rifles. Hartford. Army Weapons Command, Rock Island Arsenal, Rock Island, Ill.

—Hughes Aircraft, Fullerton, Calif. $2,232,348. Man-packed radio sets (AN/PRC-74). Fullerton. Southwest Procurement Agency, Pasadena, Calif.

—Bell Helicopter Co., Fort Worth, Tex. $1,600,550. Airframe structural components for UH-1 helicopter modification kits. Fort Worth. Army Aviation Materiel Command, St. Louis.

—FMC Corp., San Jose, Calif. $1,028,535. Metal parts for 90mm projectiles (XM594). San Jose. Picatinny Arsenal, Dover, N.J.

—Whirlpool Corp., Evansville, Ind. $2,004,372. 90mm canister assemblies (XM593). Evansville. Picatinny Arsenal, Dover, N.J.

—Northrop Corp., Anaheim, Calif. $2,056,358. 90mm canister assemblies (XM593). Anaheim. Picatinny Arsenal, Dover, N.J.

23—URS Corp., Burlingame, Calif. $2,133,534. Technical reports, computer programs, & test plans for automation of selected logistics, personnel and administrative functions for the combat service support system. Fort Huachuca, Ariz. Army Electronics Proving Ground, Fort Huachuca.

—General Dynamics, Pomona, Calif. (1) $1,529,200. Engineering services for the rocket motor for Redeye; (2) $1,107,311. Test sets for Redeye. Pomona. Southwest Procurement Agency, Pasadena, Calif.

—Stelma, Inc., Stamford, Conn. $2,790,045. Telephone-telegraph terminals (AN/TCC-29). Stamford. Army Electronics Command, Philadelphia.

—Pacific Ventures, Inc. & West Coast Electric of Washington, Seattle, Wash. $1,400,000. Upgrading improving Defense Communications power plants in Alaska. Engineer Dist., Anchorage, Alaska.

—Dravo Inc., Pittsburgh, Pa. $24,377,294. Newbergh Lock & Dam, Ohio River Project. Evansville, Ind. Engineer Dist. Louisville, Ky.

—General Motors, Detroit. $1,856,368. Engines for M113 vehicles (6V53). Detroit. Army Tank Automotive Center, Warren, Mich.

—General Electric, Burlington, Vt. $1,780,011. 7.62mm aircraft machine guns & ancillary equipment. Army Weapons Command, Rock Island Arsenal, Ill.

—Northrop-Carolina, Inc., Asheville, N.C. $1,094,792. 105mm canisters & smoke rounds. Asheville. Edgewood Arsenal, Md.

24—Chrysler Motors, Detroit. $4,502,279. 1,411 one-ton cargo trucks and 75 one-ton ambulances. Warren, Mich. Project Manager, General Purpose Vehicles, Army Mobility Command, Warren, Mich.

—Sperry Rand Corp., New York City. $10,644,728. 2.75 inch rocket warheads and fuzes. Army Ammunition Plant, Shreveport, La. Ammunition Procurement and Supply Agency, Joliet, Ill.

—Mason & Hanger, Silas Mason Co. Inc., Lexington, Ky. $4,546,100. 500 and 750 lb bombs. Cornhusker Army Ammunition Plant, Grand Island, Neb. Ammunition Procurement and Supply Agency, Joliet, Ill.

—Hercules Inc., Wilmington, Del. $8,225,700. Propellants. Sunflower Army Ammunition Plant, Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Wilcox Electric Co., Inc., Kansas City, Mo. $2,350,203. Transponder sets (AN/APX-44). Falls Church, Va. and Kansas City. Army Electronics Command, Fort Monmouth, N.J.

—Northrop Corp., Newbury Park, Calif. $1,391,000. Target missile and tracking exercise flights. Newbury Park (20%) and 80% at various overseas locations. Army Missile Command, Huntsville, Ala.

—R.C.A., Van Nuys, Calif. $3,500,00. Classified electronic equipment. Van Nuys. Army Electronics Command, Fort Monmouth, N.J.

—Meador Contracting Co., Mobile, Ala. $1,195,200. Work on Miller Ferry Lock and Dam, Alabama, Project. Camden, Ala. Engineer Dist. Mobile, Ala.

—Kanarr Corp., Kingston, Pa. $1,322,770. M79 grenade launchers. Kingston. Army Weapons Command, Rock Island, Ill.

—TRW, Inc., Cleveland, Ohio. $1,486,860. M79 grenade launchers. Cleveland. Army Weapons Command, Rock Island, Ill.

—ARF Products, Inc., Raton, N.M. $3,164,734. Ground Radio Set Group (OA-1387) components. Raton. Army Electronics Command, Philadelphia.

—General Dynamics, Rochester, N.Y. $3,559,566. Digital Subscriber Terminal Equipment (AUTODIN). Rochester. Army Electronics Command, Fort Monmouth, N.J.

—Jackes-Evans Mfg. Co., St. Louis. $1,217,272. Metallic belt links for 7.62mm cartridges. St. Louis. Frankford Arsenal, Philadelphia.

—KDI Corp., Cincinnati, Ohio. $1,048,4[illegible] Ammunition components. Cincinnati. Ammunition Procurement and Supply Agency, Joliet, Ill.

—Kaiser Jeep Corp., Toledo, Ohio. $4,54[illegible]033; $28,636,803; and $19,423,263. 2½-ton trucks with Government furnished engines. Toledo and South Bend, Ind. Project Manager, General Purpose Vehicles. Army Mobility Command, Warren, Mich.

27—D. E. Goodchild, Inc., Circleville, Ohio. $1,109,447. Paint Creek Reservoir, Ohio River Project, Highland, County, Ohio. Engineer Dist. Huntington, W. Va.

—Silberberger Construction, Inc., Vista, Calif. $7,688,250. Dana Point Project. Dana Point Harbor, Calif. Engineer Dist., Los Angeles.

—International Telephone & Telegraph, Nutley, N.J. $2,509,300. Communications systems spare parts. Nutley. Army Electronics Command, Fort Monmouth, N.J.

—Page Communications Engineers, Inc. Washington, D.C. $37,679,900. Integrated wide band communications system, Vietnam. Army Electronics Command, Fort Monmouth, N.J.

—General Electric, Red Bank, N.J. $3,19[illegible]978. Communications equipment maintenance sets and tool kits. West Lynn, Mass. Army Electronics Command, Fort Monmouth, N.J.

—Control Data Corp., Rockville, Md. $2,000,000. Electronic equipment. Minneapolis, Minn. Army Electronics Command, Fort Monmouth, N.J.

—Pettibone-Mulliken Corp., Washington, D.C. $1,003,209. Scoop type, 2½ cubic yd bucket loaders, Chicago. Army Mobility Equipment Center, St. Louis.

—Federal Cartridge Corp., Minneapolis, Minn. $2,032,200. 5.56mm ammunition. Minneapolis. Army Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Motors, Allison Div., Indianapolis, Ind. $1,544,140. Steering gear assemblies for the M114 & M116 vehicles. Indianapolis. Army Tank Automotive Center, Warren, Mich.

—General Motors, Allison Div., Indianapolis, Ind. $1,174,880. Transmission assemblies for tracked vehicles. Indianapolis. Army Tank-Automotive Center, Warren, Mich.

—General Motors, Allison Div., Indianapolis, Ind. $3,147,000. Transmission assemblies for tanks, Indianapolis, Army Tank Automotive Center, Warren, Mich.

—International Harvester Co., Chicago. $1,504,178. Truck tractors. Fort Wayne, Ind. Army Tank Automotive Center, Warren, Mich.

—Mack Truck Co., Allentown, Pa. $1,676,962. 10 ton truck axle sets. Allentown. Army Tank Automotive Center, Warren, Mich.

—FMC Corp., San Jose, Calif. $4,793,256. M113 personnel carriers and M548 cargo carriers. South Charleston, W. Va. Army Tank Automotive Center, Warren, Mich.

—Vinnell Corp., Alhambra, Calif. $1,422,685. Electrical land distribution system for Vietnam. Vietnam and Los Angeles, Calif. Army Mobility Equipment Center, St. Louis.

—Vinnell Corp., Alhambra, Calif. $2,918,353. Activation of T-2 oil tankers for operations as floating power bridges. Seattle, Wash.; Mobile, Ala.; Jacksonville, Fla.; and Newport News, Va. Army Mobility Equipment Center, St. Louis, Mo.

—Vinnell Corp., Alhambra, Calif. $1,950,000. Construction and operation of a maintenance facility in South Vietnam. Army Mobility Equipment Center, St. Louis.

—Washington University, St. Louis. $1,000,000. Research in micromodular computer systems. St. Louis. Defense Supply Service Washington, D.C.

—Martin-Marietta, Baltimore, Md. $2,634,964. Demolition kits. Baltimore. Picatinny Arsenal, Dover, N.J.

—Frequency Engineering Laboratories, Framingdale, N.J. $6,374,615. AN/GRC-50 radio sets. Framingdale. Army Electronics Command, Philadelphia.

—Delco Radio Div. of GMC, Kokomo, Ind. $1,483,150. AN/PRT-4 radio transmitters and AN/PRR-9 radio receivers. Kokomo. Army Electronics Command, Philadelphia.

—Stanford University, Palo Alto, Calif. $1,402,801. Research of advance information processing. Palo Alto. Defense Supply Service, Washington, D.C.

—Norris Thermador Corp., Los Angeles. $16,348,435. 81mm and 60mm projectiles and 105mm cartridge cases. River Bank Army Ammunition Plant, River Bank.

Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Continental Motors Corp., Muskegon, Mich. $11,139,342. Five-ton truck multi-fuel engines. Muskegon. Project Manager, General Purpose Vehicles, Army Mobility Command, Warren, Mich.

—Kaiser Jeep Corp., Toledo, Ohio. $47,175,-642. Five-ton trucks. South Bend, Ind. Project Manager, General Purpose Vehicles, Army Mobility Command, Warren, Mich.

28—Electronic Assistance Corp., Red Bank, N.J. $1,096,122. Radio receivers. Red Bank. Army Electronics Command, Philadelphia.

—Kaiser Jeep Corp., Toledo, Ohio. $4,473,-823. 5-ton wreckers. South Bend, Ind. Project Manager General Purpose Vehicles, Army Mobility Command, Warren, Mich.

—Atlas Chemical Industries, Inc., Wilmington, Del. $14,713,613. TNT and O&MA activities. Volunteer Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Olin Mathieson Chemical Corp., New York City. $20,113,830. Propellants for small arms and rockets and O&MA activities. Badger Army Ammunition Plant, Baraboo, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Murphy Brothers, Inc., Spokane, Wash. $5,754,427. Construction on the Port Neuf River, Pocatello, Idaho, Local Protection Project. Pocatello. Engineer Dist., Walla Walla, Wash.

—List & Clark Construction Co., Overland Park, Kan. $2,099,679. Perry Dam and Reservoir, Perry, Kans., Project. Completion of dam embankment. Engineer Dist., Kansas City, Mo.

—Gahagan Dredging Corp., Tampa, Fla. $1,324,220. Galveston Harbor and Channel Project. Galveston, Tex. Engineer Dist., Galveston, Tex.

—Southeast Drilling, Denver, Colo. $1,231,-622. Classified construction. Work will be done at a classified area. Army Engineer Division, Mediterranean.

—Halliburton Enterprises, Inc., Los Angeles. $1,606,968. Mono-pak containers for Redeye missiles. Los Angeles. Army Missile Command, Redstone Arsenal, Huntsville, Ala.

—Harvey Aluminum, Inc., Torrance, Calif. $1,554,168. 40mm, M169, metal parts. Torrance. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Eagle Engineering Corp., Louisville, Ky. $1,381,944. Military standard small engine generator sets. Louisville. Army Mobility Equipment Center, St. Louis.

—Hamilton Watch Co., Lancaster, Pa. $4,-606,511. Fuezs for artillery ammunition. Lancaster. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Ingraham Co., Bristol, Conn. $3,062,500. Fuzes for artillery ammunition. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Stockton Port District, Stockton, Calif. $5,196,088. Stevedoring services. Western Area, Military Traffic Management & Terminal Services, Oakland, Calif.

—Honeywell, Inc., Hopkins, Minn. $1,625,-886. Fuzes, XM218 (loaded); grenade assemblies, M40. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Western Electric, New York City. $1,893,260. Installation of Nike Hercules modification kits. Classified CONUS and overseas locations. Army Missile Command, Redstone Arsenal, Huntsville, Ala.

—Grumman Air Engineering Corp., Long Island, N.Y. $1,246,000. Modifications on 16 OV-1 Mohawk aircraft. Beth Page, Long Island, N.Y. Army Aviation Material Command, St. Louis.

—Chamberlain Corp., Waterloo, Iowa. $1,-206,765. Rocket warheads. Waterloo. Edgewood Arsenal, Md.

—Bulova Watch Co. Inc., Providence, R. I. $2,945,504. Head assemblies for fuzes, (60mm projectile). Providence. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $24,956,-000. Fuzes, (40mm Projectile). Twin Cities Army Ammunition Plant, New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—K. P. Food Service of Fort Bliss, Inc., Springhill, La. $1,048,551. Kitchen police services for the period July 1, 1966 through June 30, 1967. Fort Bliss, Tex. Fort Bliss Purchasing & Contracting Office, Fort Bliss, Tex.

—R.C.A., Camden, N.J. $3,958,948. Radio sets (AN/GRC-50), radio relay sets and light weight ground sets. Camden, N.J. Army Electronics Command, Philadelphia.

29—University of Michigan, Ann Arbor, Mich. $1,749,985. Maintenance and operation of the Mt. Haleakala observatory in Maui, Hawaii. Ann Arbor, Mich. and Maui, Hawaii. Defense Supply Service, Washington, D.C.

—Rand Corp., Santa Monica, Calif. $1,329,-569. Research program of potential conflicts likely to arise in the next 10 years. Santa Monica. Defense Supply Service, Washington, D.C.

—Rand Corp., Santa Monica, Calif. $3,402,-150. Theoretical conceptual studies of advanced military weapon systems and components. Santa Monica. Defense Supply Service, Washington, D.C.

—Southwest Truck Body Co., St. Louis. $1,077,186. Semi-trailers. West Plains, Mo. Army Tank Automotive Center, Warren, Mich.

—Southwest Truck Body Co., St. Louis. $2,867,887. semi-trailers. West Plains, Mo. Army Tank Automotive Center, Warren, Mich.

—H. K. Ferguson Co., Cleveland, Ohio. $1,-341,700. Rehabilitation of the Cleveland Army Tank Automotive Plant. Engineer Dist., Louisville, Ky.

—Bernard McMenamy Contractor, Inc., St. Charles, Mo. $1,869,400. Work on the Sny Island Levee Drainage District, Reach #3 Flood Control Project. Engineer Dist., Rock Island, Ill.

—Pettibone Mulliken Corp., Chicago. $3,-600,000. 5,000-ton trucks. Chicago. Army Mobility Equipment Center, St. Louis.

—FMC Corp., San Jose, Calif $2,449,500. XM501E3 Hawk loader Transporters. San Jose. Army Tank Automotive Center, Warren, Mich.

—Garwood Industries, Inc., Wayne, Mich. $1,710,580. Assemblies and sub-assemblies for trucks. Wayne. Army Tank Automotive Center, Warren, Mich.

—General Motors, Pontiac, Mich. $5,649,202. Pontiac. Assemblies and sub-assemblies for trucks. Mansfield. Army Tank Automotive Center, Warren, Mich.

—Mansfield Tire & Rubber Co., Mansfield, Ohio. $1,484,102. Tires for light trucks. Mansfield. Army Tank Automotive Center, Warren, Mich.

—Holt Brothers, Stockton, Calif. $2,273,926. Generator Sets. Stockton. Army Mobility Equipment Center, St. Louis.

—Red River Army Depot, Texarkana, Tex. $7,800,000. Conversion of M103A1 tanks to M103A2. Army Weapons Command, Rock Island Arsenal, Ill.

—HRB Singer, Inc., State College, Pa. $4,-199,988. AN/AAS-14A Infrared detecting sets, part of AN/UAS-4A infrared surveillance system. State College. Army Electronics Command, Philadelphia.

—General Dynamics Electronics, Rochester, N.Y. $4,686,700. Radio teletypewriter sets. Rochester. Army Electronics Command, Philadelphia.

—Raytheon Co., Lexington, Mass. $2,074,710. Guidance and control system for Hawk. Lexington. Army Missile Command, Redstone Arsenal, Huntsville, Ala.

—General Motors, Allison Div., Indianapolis, Ind. $1,780,646. Breech mechanism assemblies for 152 mm gun/launcher. Indianapolis. Watervliet Arsenal, N.Y.

—General Motors, Allison Div., Indianapolis, Ind. $1,734,803. Breech mechanism assemblies for gun/launcher M60A1E1 tank turret. Indianapolis. Watervliet Arsenal, N.Y.

—Alcan Aluminum Corp., Riverside, Calif. $1,319,827. M54 rocket motors. Riverside. Southwest Procurement Agency, Pasadena, Calif.

—Philco Corp., Newport Beach, Calif. $5,-488,702. Six months industrial engineering services for the Shillelagh Missile. Newport Beach. Southwest Procurement Agency, Pasadena, Calif.

—Sperry Rand Corp., Phoenix, Ariz. $3,200,-000. Radio magnetic compasses. Phoenix. Southwest Procurement Agency, Pasadena, Calif.

—Stevens Mfg. Co., Ebensburg, Pa. $1,846,-628. Two-wheel cargo trailers, M416. Ebensburg. Army Tank Automotive Center, Warren, Mich.

—Johnson Corp., Belleville, Ohio. $2,690,565. Cargo trailers, M105A2. Belleville. Army Tank Automotive Center, Warren, Mich.

—General Dynamics, San Diego, Calif. $1,300,000. Range measurement system testing with troops at Fort Ord, Calif. Northwest Procurement Agency, Oakland, Calif.

—City Wide Janitorial Service, Atlanta, Ga. $1,550,635. KP Services in 14 mess halls at Aberdeen Proving Grounds, Md. Aberdeen Proving Grounds, Md.

—Lyles Construction Co., Montgomery, Ala. $2,102,994. Phase two of construction and rehabilitation of U.S. Army Training Centers. Fort Bragg, N.C. Engineer Dist., Savannah, Ga.

—R.C.A., Camden, N.J. $3,800,480. Portable manpack FM radio sets. Camden. Army Electronics Command, Philadelphia.

—Ingraham Co., Bristol, Conn. $1,252,304. Metal parts for the 4.2 mortar. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $9,389,298. Fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Time Corp., Aeronetics Div., Stamford, Conn. $1,956,084. Bomb fuzes and metal parts. Gadsden, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $2,469,143. M-219 fuzes, components of cluster bomb units. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—A C F Industries, Carter Carburetor Div., St. Louis. $2,968,000. Fuzes and metal parts for 81mm mortar. Olivette, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

30—Cornell University, Ithaca, N.Y. $2,291,000. Materials research program. Ithaca. Defense Supply Service.

—University of Illinois, Champagne-Urbana, Ill. $4,201,000. Materials research program. Urbana. Defense Supply Service.

—Brown University, Providence, R.I. $1,646,-260. Materials research program. Providence. Defense Supply Service.

—University of Pennsylvania, Philadelphia. $2,500,000. Materials research program. Philadelphia. Defense Supply Service.

—University of Chicago, Chicago, Ill. $1,-165,000. Materials research program. Chicago. Defense Supply Service.

—Stanford University, Palo Alto, Calif. $1,-276,000. Materials research program. Palo Alto. Defense Supply Service.

—Northwestern University, Evanston, Ill. $1,664,890. Materials research program. Evanston. Defense Supply Service.

—M.I.T., Cambridge, Mass. $2,200,000. Materials research program. Cambridge. Defense Supply Service.

—J. H. Pomeroy & Co. and M-B Contracting Co., San Francisco. $3,900,000. Runway improvements at Kadena AFB, Okinawa. Engineer Dist., Okinawa.

—Farmers Chemical Association, Tyner, Tenn. $2,727,950. Manufacture of TNT. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Philco Corp., Newport Beach, Calif. $1,-015,560. Additional equipment for the Shillelagh missile. Newport Beach. Army Missile Command, Huntsville, Ala.

—Philco Corp., Newport Beach, Calif. $1,-624,890. Research and development in support of the Shillelagh missile system. Newport Beach. Army Missile Command, Huntsville, Ala.

—Sperry Rand Corp., Salt Lake City, Utah. $1,133,913. Engineering services for the Sergeant missile system. Salt Lake City. Army Missile Command, Huntsville, Ala.

—Sperry Rand Corp., Salt Lake City, Utah. $4,700,000. Sergeant missile body section and control surface assemblies. Salt Lake City. Army Missile Command, Huntsville, Ala.

—Bell Helicopter Co., Fort Worth, Tex. $1,-000,072. Increased production improvement for UH-1 helicopters. Tarrant County, Tex. Army Aviation Materiel Command, St. Louis.

—AVCO Corp., Stratford, Conn. $2,934,035. Materials and services for CY 66 production improvement program on UH-1 helicopters. Stratford. Army Aviation Materiel Command, St. Louis.

—AVCO Corp., Stratford, Conn. $22,107,483. Engines for UH-1 helicopters. Stratford. Army Aviation Materiel Command, St. Louis.

—General Motors, Allison Div., Indianapolis, Ind. $1,012,264. Engines for LOH aircraft. Indianapolis. Army Aviation Materiel Command, St. Louis.

—Marvel Mfg. Co., Washington, D.C. $1,511,-266. Aircraft propeller and rotor wing balancing equipment. Caldwell, N.J. Army Aviation Materiel Command, St. Louis.

—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $7,500,000. CH-54A heavy lift cargo helicopters. Stratford.

Army Aviation Materiel Command, St. Louis.
—Bell Helicopter Co., Fort Worth, Tex. $1,611,200. Configuration change to UH-1D and UH-1B utility helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.
—Boeing Co., Vertol Div., Morton, Pa. $3,260,169. CH-47 (Chinook) spare parts. Morton. Army Aviation Materiel Command, St. Louis.
—Bell Helicopter Co., Fort Worth, Tex. $9,457,443. UH-1B and UH-1D utility helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis.
—United Aircraft, Sikorsky A/C Div., Stratford, Conn. $2,000,000. Training devices for CH54A heavy lift cargo helicopters. Stratford. Army Aviation Materiel Command, St. Louis.
—Brezina Construction Co., Salt Lake City, Utah. $1,211,000. Tower grid modernization. Dugway Proving Ground, Utah. Engineer Dist., Sacramento, Calif.
—Hughes Aircraft, Culver City, Calif. $3,698,000. Advanced production engineering on TOW. Tucson, Ariz. Army Missile Command, Huntsville, Ala.
—J. H. Beers, Inc., Bangor, Pa. $1,428,611. Work on the Beltsville Dam and Reservoir Project. Lehighton, Pa. Engineer Dist., Philadelphia.
—Bowen-McLaughlin-York, York, Pa. $1,531,000. Utility truck platforms. York. Army Tank Automotive Center, Warren, Mich.
—North American Aviation, Anaheim, Calif. $1,331,660. Automatic data processing facility. Anaheim and Washington, D.C. Army Map Service, Corps of Engineers.
—Stevens Mfg. Co., Ebensburg, Pa. $1,268,219. Cargo trailers and chassis. Ebensburg. Army Tank Automotive Center, Warren, Mich.
—Continental Motors, Muskegon, Mich. $3,577,100. Engine assembly with tank containers. Muskegon. Army Tank Automotive Center, Warren, Mich.
—Case-Master Body, Inc., Rose City, Mich. $2,699,371. Water tank trucks. Rose City. Army Tank Automotive Center, Warren, Mich.
—N. H. Spinks, Sr., Ent., Inc., Fort Worth, Tex. $1,064,336. UH-1 utility helicopter seats. Forth Worth. Army Aviation Materiel Command, St. Louis.
—International Harvester Co., San Diego, Calif. $2,262,581. Auxiliary power units for CH-47 helicopters. San Diego. Army Aviation Materiel Command, St. Louis.
—Boeing Co., Vertol Div., Morton, Pa. $2,970,000. Rate tooling applicable to CH-47 aircraft. Morton. Army Aviation Materiel Command, St. Louis.
—Aerojet General Corp., Azusa, Calif. $1,746,428. UH-1 aircraft shell armor seats. Azusa. Army Aviation Materiel Command, St. Louis.
—Raytheon Co., Lexington, Mass. $3,500,000. Engineering services for the Hawk missile system. Andover, Mass. Army Missile Command, Huntsville, Ala.
—Raytheon Co., Lexington, Mass. $1,600,000. Engineering services, quality assurance and control for the Hawk missile system. Andover, Mass. Army Missile Command, Huntsville, Ala.
—Raytheon Co., Lexington, Mass. $1,762,116. Engineering change orders for selected items for the Hawk missile system. Andover, Mass. Army Missile Command, Huntsville, Ala.
—Raytheon Co., Lexington, Mass. $11,907,058. Selected items for the Hawk missile system. Andover and Waltham, Mass. Army Missile Command, Huntsville, Ala.
—Norris Thermador Corp., Los Angeles. $1,511,500. Projectiles. Los Angeles. Southwest Procurement Agency, Pasadena, Calif.
—General Electric, Pittsfield, Mass. $3,384,146. Research and development work. Pittsfield, Mass.; Syracuse and Schenectady, N.Y. Aberdeen Proving Ground, Md.
—Raytheon Co., Wayland, Mass. $1,051,097. Services and materials for ABAR radar sets. Wayland. Army Electronics Command, Philadelphia.
—General Dynamics, Electronics Div., Rochester, N.Y. $1,478,877. HF/SSB simulators. Rochester. Army Electronics Command, Philadelphia.
—Astro Communication Labs, Inc., Gaithersburg, Md. $1,072,300. Classified electronic equipment. Gaithersburg. Army Electronics Command, Fort Monmouth, N.J.
—Tridea Electronics Corp., South Pasadena, Calif. $1,356,366. Radio beacons. South Pasadena. Army Electronics Command, Philadelphia.

—Collins Radio Co., Dallas, Tex. $1,764,108. Radio Sets. Richardson, Tex. Army Electronics Command, Philadelphia.
—General Motors, Indianapolis, Ind. $1,012,938. Transmissions used in the M107, M110 and M578 vehicles. Indianapolis. Army Tank Automotive Center, Warren, Mich.
—Institute of Defense Analysis, Arlington, Va. $2,456,983. Research surveys and analysis. Arlington. Defense Supply Service.
—Institute of Defense Analysis, Arlington, Va. Research and analysis on military and scientific capabilities. Arlington. Defense Supply Service.
—Bowen-McLaughlin-York, Inc., York, Pa. $4,183,880. Self-propelled guns, howitzers & vehicles. York. Army Tank Automotive Center, Warren, Mich.
—Chrysler Motors, Detroit. $7,463,604. Cargo trucks. Detroit. Army Tank Automotive Center, Warren, Mich.
—Microdot, Inc., South Pasadena, Calif. Modulation calibrator. South Pasadena. Frankford Arsenal, Philadelphia.
—General Dynamics, Pomona, Calif. $1,247,000. Line items of maintenance equipment and documentation for depot rebuild capabilities for Toole Depot. Pomona. Army Missile Command, Redstone Arsenal, Huntsville, Ala.
—Pace Corp., Memphis, Tenn. $1,118,132. Surface trip flare, M49A1. Memphis. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Collins Radio Co., Richardson, Tex. $4,080,084. Radio sets. Richardson. Army Electronics Command, Fort Monmouth, N.J.
—Collins Radio Co., Richardson, Tex. $4,347,641. Radio sets. Richardson. Army Electronics Command, Fort Monmouth, N.J.
—Sylvania Electric Products, Inc., Mountain View, Calif. $1,500,000. Classified electronics equipment. Mountain View. Army Electronics Command, Fort Monmouth, N.J.
—Philco Corp., Newport Beach, Calif. $1,327,738. Guidance & control components for the Shillelagh Missile system. Newport Beach. Army Missile Command, Redstone Arsenal, Huntsville, Ala.
—Continental Motors Corp., Muskegon, Mich. $1,369,993. Engines for the M60 tank. Muskegon. Army Tank Automotive Center, Warren, Mich.
—Boeing Co., Vertol Div., Morton, Pa. $2,970,000. Increasing the production capabilities of the CH-47 aircraft. Morton. Army Aviation Materiel Command, St. Louis.
—International Telephone & Telegraph Corp., Nutley, N.J. $1,500,000. Radio assemblages. Nutley. Army Electronics Command, Fort Monmouth, N.J.
—Hughes Aircraft Co., Fullerton, Calif. $2,003,257. Radio sets. Fullerton, Army Electronics Command, Philadelphia.
—LTV, Electro System, Inc., Greenville, Tex. $3,071,102. Modification of U-8D & U-6A aircraft. Greenville. Army Aviation Material Command, St. Louis.
—General Motors, Allison Div., Indianapolis, Ind. $1,211,975. Transmissions for combat vehicle M48 & M103. Indianapolis. Army Tank Automotive Center, Warren, Mich.
—Hupp Corp., Canton, Ohio $13,838,175. Multi-fuel engines for trucks. Canton. Project Manager, General Purpose Vehicles, Army Mobility Command, Warren, Mich.
—MIT, Div. of Sponsored Research, Cambridge, Mass. $1,275,000. One-year of basic & applied research. Cambridge Army Electronics Command, Fort Monmouth, N.J.
—Chamberlain Corp., Waterloo, Iowa. $6,207,082. Projectiles. Army Ammunition Plant, Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.
—FMC Corp., Santa Clara, Calif. $3,150,000. Projectiles for 4.2 inch mortar shells. Santa Clara, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Norris Thermador Corp., Vernon, Calif. $1,799,607. New production equipment to manufacture the 81mm mortar shell and reactivation costs of the Riverbank Army Ammunition Plant, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.
—REDM Corp., Wayne, N.J. $7,720,488. Head assemblies for fuzes. Wayne. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Carter Carburetor Co., St. Louis. $1,640,774. Point detonating fuzes. Olivette, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.
—Strong Electric Co., Toledo, Ohio. $1,451,195. Searchlights. Toledo. Army Electronics Command, Fort Monmouth, N.J.

—White Motor Corp., Lansing, [illegible] 510,629. Production and [illegible] M600 vehicles. Lansing. Project [illegible] General Purpose Vehicles. Army [illegible] Command, Warren, Mich.
—Bell Helicopter Co., Fort Worth [illegible] 758,763. UH-1 helicopters. [illegible] Army Aviation Materiel Com[illegible] Louis.
—American Machine & Foundry Co., [illegible] lyn, N.Y. $4,783,928. Demoli[illegible] Brooklyn. Ammunition Pro[illegible] Supply Agency, Joliet, Ill.
—Sylvania Electric Products, Inc., [illegible] ium, Pa. $1,164,630. Fuzes. [illegible] Picatinny Arsenal, Dover, N.J.
—Bowen McLaughlin-York, York, [illegible] 216,714. Self-propelled guns, [illegible] recovery vehicles. York. Army Ta[illegible] motive Center, Warren, Mich.
—Collins Radio Co., Cedar Rap[illegible] $4,258,625. Radio sets. Cedar Ra[illegible] Electronics Command, Fort [illegible] N.J.
—Raytheon Co., Bristol, Tenn. [illegible] Bomb fuezs. Bristol. Picatinny [illegible] Dover, N.J.
—Motorola, Inc., Chicago. $5,[illegible] fuzes. Chicago. Picatinny Arse[illegible] N.J.
—Firestone Tire & Rubber Co., Ak[illegible] $1,132,047. Combat tanks, [illegible] Akron. Watervliet Arsenal, N.Y.
—Zenith Radio Corp., Chicago. [illegible] Bomb fuzes. Chicago. Picatinny [illegible] Dover, N.J.
—RCA, Lancaster, Pa. $1,000,[illegible] tensifier assemblies. Lancaster. [illegible] tronics Command, Fort Monmouth[illegible]
—Varo Inc., Garland, Tex. $1,[illegible] light scopes. Garland. Army E[illegible] Command, Fort Monmouth, N.J.
—RCA, Burlington, Mass. $2,[illegible] Installed maintenance automati[illegible] ment (DIMATE). Burlington. Ar[illegible] tronics Command, Fort Mon[illegible]
—Canadian Commercial Corp., Ot[illegible] ada. $2,289,104. TNT. Vi[illegible] McMasterville, Quebec. Ammuni[illegible] curement & Supply Agency, [illegible]
—I. D. Precision Components, Inc., [illegible] N.Y. $1,658,625. Boosters [illegible] detonators. Gadsden, Ala. Am[illegible] Procurement & Supply Agency, [illegible]
—Emerson Electric Co., St. Louis. [illegible] Rocket motors; pedestal and [illegible] services ofr Honest John Mis[illegible] Louis. Army Missile Command, [illegible] Arsenal, Huntsville, Ala.
—R. G. LeTourneau, Inc., Long[illegible] $3,100,064. Bomb demolition. [illegible] Ammunition Procurement & [illegible] Agency, Joliet, Ill.
—Raytheon Co., Lexington, Mass. [illegible] Bomb fuzes. Bristol, Tenn. Am[illegible] Procurement & Supply Agency, [illegible]
—A. O. Smith Corp., Chicago. [illegible] molition bombs. Waco, Tex. Am[illegible] Procurement & Supply Agency, [illegible]
—Amron Corp., Waukesha, Wis. [illegible] Cartridges. Waukesha. Frankford [illegible] Philadelphia.
—Harvey Aluminum, Inc., Torrance [illegible] $2,370,000. Projectiles. Torrance. F[illegible] Arsenal, Philadelphia.
—General Time Corp., Westclox [illegible] Salle, Ill. $13,983,929. Fuzes for [illegible] ammunition. LaSalle. Ammuni[illegible] curement & Supply Agency, [illegible]
—Hughes Aircraft., Culver City, Ca[illegible] 100,000. TOW/helicopters. Cu[illegible] Army Missile Command, Redstone [illegible] Huntsville, Ala.
—Ford Motors, Dearborn, Mich. [illegible] Production & inspection engi[illegible] ices on M151A1 trucks. Dearborn. [illegible] Manager, General Purpose Vehicle[illegible] Mobility Command, Warren, Mich.
—Eureka Williams Co., Blooming[illegible] $2,091,880. Bomb fuzes. Blooming[illegible] munition Procurement & Supply [illegible] Joliet, Ill.
—Raytheon Co., Lexington, Mass. [illegible] Hawk missiles. Andover, Mass. Ar[illegible] sile Command, Redstone Arsenal, [illegible] ville, Ala.
—Bendix Corp., Baltimore, Md. [illegible] Development of a portable ala[illegible] more. Edgewood Arsenal, Md.
—DeLong Corp., New York, N.Y. [illegible] Trestles and auxiliary equipment, [illegible] and towing. Hong Kong. Army [illegible] Equipment Center, St. Louis.
—American Hoist & Derrick Co., S[illegible] Minn. $1,411,920. Truck-mounted [illegible] shovels. St. Paul. Army Mobility [illegible] ment Center, St. Louis, Mo.
—E. I. DuPont Denemours & Co., [illegible]

ton, Del. $1,239,106. TNT. Barksdale, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—RCA, Camden, N.J. $1,500,000. Classified research & development electronic equipment. Camden. Army Electronics Command, Ft. Monmouth, N.J.

—Bell Helicopter Co., Ft. Worth, Tex. $2,360,104. Blade assemblies for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

NAVY

1—Dero Electronics, Washington, D.C. $6,691,689. Communications equipment for naval ships. McLean, Va. Naval Ship Systems Command.

—General Electric, Washington, D.C. $1,348,795. Development of coating processes and equipment to improve the reliability of the LM-1500 gas turbine engine for marine use. Evendale, Ohio. Naval Ship Systems Command.

—Zenith Radio Corp., Chicago. $2,478,923. Target detecting devices for Sidewinder missiles. Chicago. Naval Air Systems Command.

—Westinghouse Electric, Baltimore, Md. $4,230,000. Airborne radar sets for the Air Force. Baltimore. Naval Air Systems Command.

—Douglas Aircraft, Long Beach, Calif. $3,700,000. TA-4E aircraft. Long Beach. Naval Air Systems Command.

—Raytheon Co., Lexington, Mass. $2,873,230. Airborne radar sets. Bristol, Tenn. Naval Air Systems Command.

—Sargent-Fletcher Co., El Monte, Calif. $2,240,184. Mark 77 fire bombs. El Monte. Navy Ordnance Plant, Louisville, Ky.

—Raytheon Co., Portsmouth, R.I. $12,345,500. Sonar equipment for installation on naval ships. Portsmouth. Naval Ship Systems Command.

—Gorham Corp., Waltham, Mass. $5,511,042. Communications equipment for naval ships. Waltham. Naval Ships Systems Command.

—Honeywell, Inc., Seattle, Wash. $1,070,175. Telegraph terminal equipment for naval ships. Seattle. Naval Ship Systems Command.

—Collins Radio Co., Richardson, Tex. $3,570,000. 68 transportable communication centrals (AN/TSC-15). Cedar Rapids, Iowa. U.S. Marine Corps.

2—Aluminum Company of America, Pittsburgh, Pa. $3,378,500. Motor tubes for 2.75 inch rockets. New Kensington, Pa. Naval Ships Parts Control Center, Mechanicsburg, Pa.

3—Southeastern Electric Contracting Co., and Volta Electric Co., Virginia Beach, Va. $1,366,300. Construction of an electrical distribution system at the Sewells Point Area, Naval Station, Norfolk, Va. Atlantic Div., Naval Facilities Engineering Command.

—North American Aviation, Columbus, Ohio. $1,172,000. Conversion of A-5A weapons systems to RA-5C configuration. Columbus. Naval Air Systems Command.

—Bunker-Ramo Corp., Canoga Park, Calif. $2,147,692. Digital data computers. Canoga Park. Naval Ship Systems Command.

—General Instrument Corp., Hicksville, N.Y. $1,750,000. Battlefield surveillance radars. Hicksville. Naval Ship Systems Command.

—RCA, Camden, N.J. $6,414,877. $1,592,601. Classified communications countermeasure equipment. Camden. Naval Ship Systems Command.

6—Technical Material Corp., Mamaroneck, N.Y. $3,440,210. Radio communications systems for shore electronics systems. Mamaroneck. Navy Purchasing Office, Washington, D.C.

—General Electric, Seattle, Wash. $3,367,600. Main propulsion units for supply ships. West Lynn, Mass. Puget Sound Naval Shipyard, Bremerton, Wash.

—Nil-Pak Co., Parkesburg, Pa. $3,306,205. Steel pallets for use in transporting bombs. Parkesburg. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Garrett Corp., AiResearch Mfg. div., Los Angeles. $3,863,660. Compressor power units and gas turbine compressor power engines. Los Angeles. Naval Air Systems Command.

—Raytheon Co., Lexington, Mass. $2,030,002. Radar sets and related equipment. North Dighton, Mass. Naval Air Systems Command.

—Yankee Walter Corp., Los Angeles. $4,168,571. Fire fighting trucks for use at Navy and Marine Corps airfields. Vorheesville, N.Y. and Los Angeles. Navy Purchasing Office, Washington, D.C.

—Babcock & Wilcox Co., Seattle, Wash. $1,057,685. Main boilers for supply ships. Seattle. Puget Sound Naval Shipyard, Bremerton, Wash.

—Admiral Corp., Chicago. $1,508,315. Parts for airborne radio communication equipment. Chicago. Naval Aviation Supply Office, Philadelphia.

7—Sperry Rand Corp., Charlottesville, Va. $1,908,112. Stabilized master compass & binnacle control cabinets & associated power supply & bridge alarm indicator equipment. Charlottesville. Naval Ship Systems Command.

—Kollmorgen Corp., Northampton, Mass. $1,885,668. Periscope systems, including adapters, repair parts & associated technical data. Northampton. Naval Ship Systems Command.

—FMC Corp., San Jose, Calif. $1,250,764. Modernization of LVTH6 vehicles (landing Vehicle Tracked Howitzer) to LVTH6A1 configuration. San Jose. Marine Corps Headquarters.

8—United Aircraft Corp., Pratt & Whitney Aircraft Div., E. Hartford, Conn. $4,000,000. Phase II of development of the TF-30-P-12 engine. E. Hartford. Naval Air Systems Command.

—Bendix Corp., Baltimore, Md. $3,220,185. Airborne Radio receiver-transmitter sets and related equipment. Baltimore. Naval Air Systems Command.

—United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn. $6,874,536. Aircraft propellers & related components. Windsor Locks. Naval Air Systems Command.

—Litton Systems, Inc., Woodland Hills, Calif. $1,200,893. Components for AN/ASQ-61 ballistic computer systems for A-6A aircraft. Navy Aviation Supply Office, Philadelphia.

—Conco Engineering Works, Inc., Mendota, Ill. $1,115,423. Mark 77 fire bombs. Mendota. Naval Ordnance Plant, Louisville, Ky.

—Harvey Aluminum, Inc., Torrance, Calif. $5,684,445. Projectiles for loading 20mm ammunition. Torrance. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—General Dynamics Corp., Electric Boat Div. Groton, Conn. $3,145,293. Classified research and development equipment. Groton. Naval Ship Systems Command.

—Collins Radio Co., Cedar Rapids, Iowa. $3,234,830. Communication, navigation & identification systems. Cedar Rapids. Naval Air Systems Command.

9—LTV Aerospace Corp., Dallas, Tex. $1,335,000. Acquisition & installation of milling machines. Dallas. Naval Air Systems Command.

—Washington Aluminum Co., Baltimore, Md. $1,314,678. Fabrication of MA-2 pallet & mat assemblies for use in SATS (Short Airfield for Tactical Support) airfields. Baltimore. Naval Air Engineering Center Philadelphia.

—Borg Warner Corp., Philadelphia. $1,611,815. High-speed paper tape reading & punching systems with related data & repair parts. Philadelphia. Naval Supply Systems Command.

10—Turnbull Elevator Inc., Erie, Pa. $1,196,943. Electromechanical elevators for AOE3 supply ships. Erie. Puget Sound Naval Shipyard, Bremerton, Wash.

—Raytheon Co., Lexington, Mass. $3,150,000. Airborne radar sets & related equipment for the Air Force. Bristol, Tenn. & Bedford, Mass. Naval Air Systems Command.

—Liles Construction Co., Montgomery, Ala. $1,158,200. Rehabilitation of BOQ & EM barracks at NALF Ellyson Field, Pensacola, Fla. Naval Facilities Engineering Command.

13—Collins Radio Co., Cedar Rapids, Iowa. $3,799,277. Communications equipment for installation on naval ships. Cedar Rapids. Naval Ship Systems Command.

—Rics Construction Co., San Diego, Calif. $1,136,442. Construction & rehabilitation of EM barracks at the Naval Auxiliary Air Station, Ream Field, Imperial Beach, Calif. Naval Facilities Engineering Command.

—Edward R. Marden Corp., Allston, Mass. $2,169,600. Construction of an aircraft maintenance hanger at the Naval Air Station, South Weymouth, Mass. Naval Facilities Engineer Command.

—Computer Measurements Co., San Fernando, Calif. $2,395,185. Electrical equipment (AN/USM-207). San Fernando. Navy Purchasing Office, Washington, D.C.

—Hughes Aircraft, Culver City, Calif. $3,362,100. Additional FY 66 funding for the Phoenix missile system. Culver City. Naval Air Systems Command.

—Sanders Associates, Inc., Nashua, N. H. $1,800,000. Research & development on electronic equipment. Nashua. Naval Air Systems Command.

—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. $10,023,000. FY 66 procurement of A-6A & EA-6B aircraft. Bethpage Naval Air Systems Command.

14—Sperry Rand Corp., Great Neck, L. I., N.Y. $17,891,530. Fabrication & test of prototype models of the Phase II integrated light attack Avionics System (ILAAS). Great Neck. Naval Air Systems Command.

—Hercules Inc., Cumberland, Md. $1,147,000. Research & development work on propellants. Cumberland. Naval Ordnance Systems Command.

—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. $5,000,000. E-2A aircraft. Bethpage. Naval Air Systems Command.

—Westinghouse Electric, Baltimore, Md. $4,835,125. AN/APG-59 radar sets. Baltimore. Naval Air Systems Command.

—General Electric, Washington, D.C. $6,331,257. MK 412 Module Test Sets. Pittsfield, Mass. Special Project Office.

—McDonnell Aircraft Corp., St. Louis. (1) $140,600,000. To increase long lead time effort for FY 66 procurement of F-4E, F-4J, F-4D and RF-4C aircraft for the Navy and Air Force; (2) $3,500,000, Long lead time effort to support procurement of F-4D mobile training units & technical Publications. St. Louis. Naval Air Systems Command.

—Sperry Rand Corp., Great Neck, L. I., N.Y. $1,180,000. Research & development work on the TALOS missile. Great Neck. Naval Ordnance Systems Command.

15—Frequency Engineering Laboratories, Farmingdale, N.J. $1,617,250. Classified electronics equipment. Farmingdale. Naval Ship Systems Command.

16—Boatel Co., Inc., Mora, Minn. $1,485,600. 56-foot mechanized landing craft (LCM 6). Mora. Naval Ship Systems Command.

—Miami Beach Yacht Corp., Miami, Fla. $2,267,529. 36-foot plastic landing craft (LCPL). Miami. Naval Ship Systems Command.

—Marinette Marine Corp., Marinette, Wis. (1) $2,391,000. Four large harbor tugs (YTB). (2) $5,549,600. 28 aluminum mechanized landing craft (LCM). Marinette. Naval Ship Systems Command.

—General Dynamics Corp., Electric Boat Div., Groton, Conn. $3,269,267. Two deep research vehicles. Groton. Naval Ship Systems Command.

—Ingalls Shipbuilding Corp., Pascagoula, Miss. $37,874,470. An amphibious assault ship (LPH). Pascagoula. Naval Ship Systems Command.

—General Electric, Washington, D.C. $1,606,500. Gas generators & power turbines for installation on naval ships. Evendale, Ohio. Naval Ship Systems Command.

17—John C. Grimberg Co., Rockville, Md. $3,194,000. Construction of an inert diluent production plant facility at the Naval Propellant Plant, Indian Head, Md. Chesapeake Div., Naval Facilities Engineering Command.

—Electronic Communications, Inc., St. Petersburg, Fla. $1,455,000. Radio sets and related equipment and services. St. Petersburg. Naval Ship Systems Command.

—Reeves Instrument Co., Garden City, N.Y. $2,612,880. Vehicle gyro compass systems for installation on naval surface ships. Garden City. Naval Ship Systems Command.

—Sundstrand Corp., Rockford, Ill. $1,345,248. Constant speed drives for A-7A aircraft. Rockford. Navy Aviation Supply Office, Philadelphia.

—General Electric, Evendale, Ohio. $1,122,094. Spare parts for J79GE10 engines. Evendale. Navy Aviation Supply Office, Philadelphia.

—R. F. Communications, Inc., Rochester, N.Y. $1,685,923. Electronic coupler groups for naval ships. Rochester. Naval Ship Systems Command.

—Texas Instrument, Inc., Dallas, Tex. $2,408,080. APQ-116 radar system components for A-7A aircraft. Dallas. Navy Aviation Supply Office, Philadelphia.

—United Aircraft, Stratford, Conn. $2,468,000. Engine components for initial outfitting of CH-53A aircraft. Stratford. Navy Aviation Supply Office, Philadelphia.

20—Giannini Controls Corp., Fairfield, N.J. $1,609,801. Spare parts to support central

air data computer systems for A-6A, EA-6A & E-2A aircraft. Fairfield. Navy Aviation Supply Office, Philadelphia.

—**Hickok Electrical Instrument Co.,** Cleveland, Ohio. $2,364,368. Oscilloscopes. Greenwood, Miss. Naval Ship Systems Command.

—**Collins Radio Co.,** Dallas, Texas. $2,000,000. Radio communications & data terminal equipment. Cedar Rapids, Iowa (35%), Richardson, Tex. (65%). Naval Ship Systems Command.

21—**Hewlett-Packard,** Rockville, Md. $1,015,341. Power measuring sets, power meters & related equipment. Palo Alto, Calif. Naval Ship Systems Command.

—**Sperry Rand Corp.,** Long Island, N.Y. $1,482,590. World-wide repair, maintenance, alteration & installation of the TARTAR/TERRIER missile system for FY 67. Long Island. Navy Purchasing Office, Los Angeles.

—**Unaka Corp.,** Greenville, Tenn. $2,168,039. (Mark 82, Mod 1) bomb fins for 500 lb bombs. Greenville. Navy Ships Part Control Center, Mechanicsburg, Pa.

—**Poloron Products Inc.,** New Rochelle, N.Y. $2,008,708. Bomb fins for 500 lb bombs. Scranton, Pa. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—**General Time Corp.,** LaSalle, Ill. $1,031,404. Mark 188 rocket fuses. Peru, Ill. Ships Parts Control Center, Mechanicsburg, Pa.

—**Dow Chemical Co.,** Camden, N.J. $6,545,022. AM-2 aluminum mat extrusions for airfields. Madison, Ill. Naval Air Engineering Center, Philadelphia.

—**Kaiser Aluminum & Chemical Sales, Inc.** Halethorpe, Md. $7,687,248. AM-2 aluminum mat extrusions. Halethorpe. Naval Air Engineering Center, Philadelphia.

—**Aluminum Co. of America,** Pittsburgh, Pa. $1,094,448. AM-2 aluminum mat extrusions. Lafayette, Ind. Naval Air Engineering Center, Philadelphia.

—**American Machine & Foundry Co.,** York, Pa. $1,233,480. Mark 56 mine anchors & for work on the Mark 56 underwater mine program. York. Naval Ordnance Plant, Louisville, Ky.

—**Goodyear Aerospace Corp.,** Akron, Ohio. $2,172,861. Refurbishing & updating of the A-6A weapons systems trainers. Akron. Naval Training Device Center, Orlando, Fla.

—**General Precision Inc.,** Binghamton, N.Y. $4,131,454. Six F-4C training sets to F-4D training sets. Binghamton (80%) Riverdale, Md. Naval Training Device Center, Orlando, Fla.

22—**Honeywell Inc.,** Hopkins, Minn. $2,055,261. Design, development & fabrication of automatic tooling for the Rockeye II weapon system. Hopkins. Navy Purchasing Office, Los Angeles.

—**Pioneer Aerodynamics Systems,** Manchester, Conn. $1,029,800. Parachute & container assemblies for Mark 24 flares. Columbia, Miss. Naval Ammunition Depot Crane, Ind.

—**Sanders Associates, Inc.,** Nashua, N. H. $12,578,640. Classified electronic equipment. Nashua. Naval Air Systems Command.

—**Westinghouse Electric Corp.,** Baltimore, Md. $29,836,692. AN/APG-59 radar sets. Baltimore. Naval Air Systems Command.

—**United Aircraft,** East Hartford, Conn. $1,048,600. Gas turbine engine program for marine application. East Hartford. Naval Ship Systems Command.

23—**Goodyear Aerospace Corp.,** Akron, Ohio. $1,526,390. One prototype aircraft carrier landing device (2-H-87). Akron. Naval Training Device Center, Port Washington, N.Y.

—**Maxon Electronics Corp.,** Macon, Ga. $1,068,054. Mark 83 Mod O fuses for five-inch 38 caliber guns. Macon. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—**North American Aviation, Inc.,** Anaheim, Calif. $1,943,750. Ships Inertial Navigation System (SINS) conversion kits with ancillary equipment. Anaheim. Naval Ship Systems Command.

—**Gyrodyne Co., of America, Inc.,** St. James, L.I., N.Y. $11,396,000. QH-50D drone helicopters. St. James. Naval Air Systems Command.

—**Honeywell Inc.,** Hopkins, Minn. $1,069,694. Short fuel tanks, extended sections & periodic testing of the MK 46 torpedo. Hopkins. Naval Ordnance Systems Command.

—**T. M. C. Systems Inc.,** Alexandria, Va. $2,979,417. Portable transmitter station consisting of 18 communication bands for installation overseas. Navy Purchasing Office, Washington, D.C.

24—**Greenhut Construction Co., Inc.** Pensacola, Fla. $1,239,958. Construction of an aircraft maintenance hanger at the Naval Air Auxiliary Station, Whiting Field, Milton, Fla. Southeast Div., Naval Facilities Engineering Command.

—**International Builders of Florida, Inc.,** Coral Gables, Fla. $2,084,000. Construction of a bachelor officers quarters and mess at the Naval Air Auxiliary Station, Saufley Field, Pensacola, Fla. Southeast Div., Naval Facilities Engineering Command.

—**Dyson & Co.,** Pensacola, Fla. $2,379,000. Construction of a bachelor officers quarters & mess at the Naval Air Auxiliary Station. Whiting Field, Milton, Fla. Naval Facilities Engineering Command.

—**George Hyman Construction Co.,** Washington, D.C. $10,072,000. Construction of a science building at the Naval Academy, Annapolis, Md. Chesapeake Div., Naval Facilities Engineering Command.

—**Anaconda Wire & Cable Co.,** New York City. $3,245,096. Minesweeping cable. Hastings-on-Hudson, N.Y. Naval Ship Systems Command.

—**Peter Kiewit Sons Co.,** Richmond, Calif. $4,895,000. Extension to ammunition piers at the Naval Weapons Station, Concord, Calif. Western Div., Naval Facilities Engineering Command.

—**U.S. Steel Corp.,** Washington, D.C. $3,150,000. Research & development of submarine hull construction. Monroeville, Pa. Naval Ship Systems Command.

27—**ITT Laboratories,** Nutley, N.J. $3,580,956. Portable radio transmitter-receivers & related items. Camden, Ark. Naval Ship Systems Command.

R.C.A., Defense Electronic Products Div., Camden, N.J. $1,471,359. Airborne Radio receiving sets and related equipment. Camden. Naval Air Systems Command.

—**Collins Radio Co.,** Cedar Rapids, Iowa. $11,533,468. Communication, navigation, identification systems. Cedar Rapids. Naval Air Systems Command.

—**United Aircraft, Pratt & Whitney Aircraft Div.,** East Hartford, Conn. $3,342,950. Spare parts used to retrofit J-48, P-6A/8A engines on F-9F aircraft. East Hartford. Naval Aviation Supply Office, Philadelphia.

—**Standard Screw Co., Western Div.,** Elyria, Ohio. $1,326,000. Head closures for 2.75" rocket motors. Elyria. Navy Ships Parts Control Center, Mechanicsburg, Pa.

29—**Grumman Aircraft Engineering Corp.,** Bethpage, L.I., New York. $3,600,000. Long lead time effort for FY-1966 procurement of A6A Weapon Systems. Bethpage. Naval Air Systems Command.

—**Gould-National Batteries, Inc.,** St. Paul, Minn. $3,326,272. Submarine storage batteries, spare cells, and associated technical manuals. Kankakee, Ill. Naval Ship Systems Command.

—**General Precision, Inc., Aerospace Group, Kearfott Products Div.,** Little Falls, N.J. $3,131,200. Airborne navigation computer sets. Clifton, N.J. Naval Air Systems Command.

—**Deco Electronics, Inc.,** Washington, D.C. $3,164,969. Radio transmitting and receiving multicouplets and antennas. McLean, Va. Naval Ship Systems Command.

—**Douglas Aircraft Co., Inc.,** Long Beach, Calif. $2,920,394. Additional funding for countermeasures sets and related equipment. Long Beach. Naval Air Systems Command.

—**ITT Federal Laboratories,** Nutley, N.J. $2,762,000. Navy automatic broadcasting processing and routing switch. Paramus, N.J. Navy Purchasing Office, Washington, D.C.

—**Bendix Corp., Bendix Radio Division,** Baltimore, Md. $2,576,148. Increased funds for airborne radio receiver-transmitter sets. Baltimore. Naval Air System Command.

—**Ling-Temco-Vought, Inc.** Greenville, Tex. $2,141,250. Services and materials for aircraft modifications. Greenville. Naval Air Systems Command.

—**Sperry Gyroscope Co.,** Syosset, L.I., N.Y. $1,776,114. Inertial navigation subsystem of Fleet Ballistic Missile Submarines. Syosset. Naval Ship Systems Command.

—**Litton Systems, Inc.,** Woodland Hills, Calif. $1,500,000. Airborne navigation computer set components. Woodland Hills. Naval Air Systems Command.

—**Douglas Aircraft Co.,** Long Beach, Calif. $1,622,729. Bomb ejector racks and related equipment. Torrance, Calif. Naval Air Systems Command.

—**Beech Aircraft Corp.,** Wichita, Kan. $1,488,500. AQM-37A aerial targets. Wichita. Naval Air Systems Command.

—**IBM Corp., Federal Systems Div.,** Bethesda, Md. $1,371,600. Research & development services to improve operation of Navy Command and Control Systems. Bethesda. Navy Purchasing Office, Washington, D.C.

—**Litton Systems Inc., Data Systems Div.,** Van Nuys, Calif. $1,398,448. Sole source contract for spare parts for use on AN/ASA27 digital computer used on E2A aircraft. Van Nuys. Navy Aviation Supply Office, Philadelphia.

—**Westinghouse Electric,** Pittsburgh, Pa. $1,191,562. Refurbishment of nuclear reactor compartment components for Navy nuclear-powered ships. Pittsburgh. Naval Ship Systems Command.

—**Development Corp. of America,** Hollywood, Fla. $2,200,000. Construction of a bachelor officers quarters and mess at the Naval Air Station, Pensacola, Fla. Southeast Div., Naval Facilities Engineering Command.

30—**Janke & Co. Inc.,** Hackensack, N.J. $1,003,274. Construction of four turbine engine test cells at the Army Aeronautical Depot Maintenance Center, Naval Air Station, Corpus Christi, Tex. Naval Facilities Engineering Command.

—**Hughes Tool Co.,** Culver City, Calif. $1,185,000. Research & development on gun pods. Culver City. Naval Air Systems Command.

—**Firestone Tire & Rubber Co.,** Akron, Ohio. $1,983,300. 15 man inflatable life boats. Magnolia, Ark. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—**Trenton Textile Engineering & Manufacturing Co.,** Trenton, N.J. $1,204,000. Parachute and container assemblies for Mark 24 flares. Trenton. Naval Ammunition Depot, Crane, Ind.

—**Woods Hole Oceanographic Institution,** Woods Hole, Mass. $1,982,594. Oceanographic research. Woods Hole. Office of Naval Research, Washington, D.C.

—**Newport News Shipbuilding & DryDock Co.,** Newport, News, Va. $3,000,000. Overhaul and refueling of the USS JOHN MARSHALL (SSB(N)611). Newport News. Naval Ship Systems Command.

—**Bunker Ramo Corp.,** Canoga Park, Calif. $3,200,000. Additional funding for ECM equipment for the Navy. Silver Spring, Md (75%) and Canoga Park (25%). Naval Air Systems Command.

—**M.I.T.,** Cambridge, Mass. $3,450,845. Computer research. Office of Naval Research, Washington, D.C.

—**Scope, Inc.,** Falls Church, Va. $4,345,902.82. Classified electronics equipment. Falls Church. Naval Ship Systems Command.

—**Stanford University,** Palo Alto, Calif. $4,400,000. Continuation of fundamental nuclear research. This contract, which also covers all operations of Stanford's High Energy Physics Laboratory through 1967, calls for further development of the superconducting linear accelerator and the possible application of its principles to the Mark III billion volt accelerator. Palo Alto. Office of Naval Research, Washington, D.C.

—**Sperry Rand Corp.,** Great Neck, L.I., N.Y. $6,068,271. Increased funds for fabrication and test of prototype models of Phase II Great Neck. Naval Air Systems Command.

—**United Aircraft, Sikorsky Aircraft Div.,** Stratford, Conn. $13,800,000. SH-3D helicopters and related equipment. Stratford. Naval Air Systems Command.

—**United Aircraft, Pratt & Whitney Div.,** East Hartford, Conn. $26,299,093. TF-33-P-7 engines for the Air Force. East Hartford. Naval Air Systems Command.

—**North American Aviation, Inc.,** Columbus, Ohio. $3,925,000. Contract Definition Phase II of the CONDOR Missile system. Columbus. Naval Air Systems Command.

—**Columbus Milpar & Manufacturing Co., Inc.,** Columbus, Ohio. $2,256,060. Arming wire assemblies for bombs. Columbus, Ohio. Navy Ships Parts Control Center, Mechanicsburg, Pa.

AIR FORCE

1—**Lear Siegler, Inc.,** Grand Rapids, Mich. $5,559,119. Production of navigation and bombing computer sets for F-4 aircraft. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—**Collins Radio Co.,** Richardson, Tex. $3,630,000. Engineering, production and installation of high frequency, single-side-band communications facilities. Richard-

son, Space Systems Div. (AFSC), Los Angeles.

2 General Motors, Indianapolis, Ind. $1,240,200, Non-recurring maintenance at Air Force Plant Number 26, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

3 Edgerton, Germeshausen & Grier, Inc., Goleta, Calif. $1,188,081, Procurement and installation of an instrumentation system, Goleta, Air Force Special Weapons Center (AFSC), Kirtland AFB, N.M.

Maxson Electronics Corp., Great River, N.Y. $4,379,911, Production of fuze assemblies for bombs, Macon, Ga., Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

Boeing Co., Seattle, Wash. $3,435,183, Research, development, test and engineering for modernization of wings I through V of the MINUTEMAN weapon system, Seattle, Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Walter Kidde Constructors, Inc., New York City, $60,000,000, Design and construction of an airfield and limited port facilities in South Vietnam, Seventh Air Force.

6 Burroughs Corp., Paoli, Pa. $1,555,852, Preliminary work on an air defense system, Paoli, Electronic Systems Div. (AFSC), L.G. Hanscom Field, Mass.

Texas Instruments, Inc., Dallas, Tex. $2,673,680, Electronics equipment for RF 4C aircraft, Dallas, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

General Dynamics Corp., San Diego, Calif. $1,225,000, Manufacture, integration and launch of space research rockets, San Diego, Ballistic Systems Div. (AFSC), Norton AFB, Calif.

7 Bullard Co., Bridgeport, Conn., $1,698,000, Production of machine tools, Bridgeport, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

AiResearch Mfg. Co., Torrance, Calif. $1,043,366, Production of computer components for F 4 aircraft, Los Angeles, Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Calif.

8 Northrop Corp., Anaheim, Calif. $1,000,000, Technical services in support of the Tactical Intelligence Processing System, Anaheim, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

9 R.C.A., Moorestown, N.J. $1,115,960, Telemetry data systems, Moorestown Air Force Eastern Test Range (AFSC), Patrick AFB, Florida.

Boeing Co., Seattle, Wash. $5,020,000, Engineering development for improved Minuteman missiles, Seattle, Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Sperry Rand Corp., Charlottesville, Va. $2,761,776, Production of components for airborne radar (AN/APN 59B) for C 141 aircraft, Charlottesville, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

10 Sylvania Electric Products, Inc., Waltham, Mass. $6,020,400, Production of communications equipment for MINUTEMAN Wing I, Buffalo, N.Y. & Waltham, Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Aerojet-General Corp., Sacramento, Calif. $3,700,000, Components for the TITAN III rocket system, Sacramento, Space Systems Div., (AFSC), Los Angeles.

13 TRW Inc., Redondo Beach, Calif. $1,024,000, Work on space-ground communications, Redondo Beach, Air Force Satellite Control Facility (AFSC), Los Angeles.

14 Northrop Corp., Hawthorne, Calif. $1,105,070, Spare parts & ground equipment for the F 5 aircraft, Hawthorne, San Antonio Air Materiel Area (AFLC) Kelly AFB, Tex.

Teledyne Industries, Inc., Pasadena, Calif. $1,142,884, Research & development services in support of a seismic data laboratory, Pasadena, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

15 Thiokol Chemical Corp., Brigham City, Utah. $1,020,340, Thrust vector control system for large solid rocket motors, Brigham City, Air Force Flight Test Center (AFSC), Edwards AFB, Calif.

20 Martin-Marietta, Denver, Colo. $7,622,000, TITAN III space booster, Denver, Space Systems Div. (AFSC), Los Angeles.

Boeing Co., Seattle, Wash. $2,400,000, Modernization of MINUTEMAN missiles, Whiteman AFB, Mo. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

Sperry Rand Corp., Long Island, N.Y. $5,950,000, Aircraft navigational systems, Long Island, Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

Federal Electric Corp., Richland, Wash. $1,169,208, Generator sets (MB TEEN), Pasco, Wash. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

McDonnell Aircraft Corp., St. Louis, $1,040,480, Modification kits, spare parts and related data for F 4 aircraft, St. Louis, Ogden Air Material Area (AFLC) Hill AFB, Utah.

21 Sierra Research Corp., Buffalo, N.Y. $1,466,742, Modification kits, spare parts & engineering services for C 130 aircraft, Buffalo, Warner Robins Air Materiel Area (AFLC), Robins AFB, Georgia.

Thiokol Chemical Corp., Brigham City, Utah, $1,210,070, Work on 156-inch solid fuel rocket motor, Brigham City, Air Force Flight Test Center (AFSC) Edwards AFB, Calif.

Consolidated Diesel Electric Co., Stamford, Conn. $5,614,427, Production of fuel servicing tank trucks (5,000 gallons capacity), Stamford, Warner-Robins Air Materiel Area (AFLC) Robins AFB, Ga.

22 Westinghouse Electric Corp., Baltimore, Md. $10,216,000, Design & production of mobile tactical air control radars, Baltimore, Electronic Systems Div (AFSC), L. G. Hanscom Field, Mass.

TRW, Inc., Redondo Beach, Calif. $1,600,000, Work on a space program, Redondo Beach, Space Systems Div (AFSC) Los Angeles.

23 General Motors, Indianapolis, Ind. $5,744,169, T 56 engine component improvement program, Indianapolis, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Aerojet-General Corp., Downey, Calif. $3,898,000, Aircraft ordnance dispensers, Downey Air Proving Grounds Center, Eglin AFB, Florida.

Aerospace Corp., El Segundo, Calif. $7,400,304, Scientific, engineering, and technical services for support of space & ballistic program, El Segundo, Space Systems Div. (AFSC), Los Angeles.

General Electric, Cincinnati, Ohio. (1) $22,619,791, Production of J 79 10 engines, and (2) $107,570,263, Production of J 79 15 engines, Cincinnati, Aeronautical Systems Div. (AFSC) Wright-Patterson AFB, Ohio

The Military Airlift Command, Scott AFB, Ill. has awarded the following contracts for services during FY 1967:

Airlift International, Inc., Miami, Fla. $19,723,000.

Alaska Airlines, Inc., Seattle, Wash. $3,163,000.

Braniff International, Dallas, Tex. $21,066,000.

Capitol Airways, Inc., Nashville, Tenn. $9,707,000.

Continental Air Lines, Inc., Los Angeles, Calif. $20,150,000.

Flying Tiger Line, Inc., Burbank, Calif. $44,711,000.

Northwest Airlines Inc. St. Paul, Minn. $40,753,000.

Overseas National Airways, Inc., Washington, D.C. $1,050,000.

Pan American World Airways, Inc. New York, N.Y. $65,358,000.

Saturn Airways, Inc., Miami, Fla. $13,451,000.

Seaboard World Airlines, Inc., Jamaica, N.Y. $22,560,000

Southern Air Transport, Inc., Washington, D.C. $7,238,000.

Trans Caribbean Airways, Inc., New York, N.Y. $7,302,000.

Trans International Airlines, Inc., Las Vegas, Nev. $9,361,000.

World Airways, Inc., Oakland, Calif. $23,394,000.

Zantop Air Transport, Inc., Inkster, Mich. $18,166,000.

Trans World Airlines, New York City. $24,143,000.

24 Hamilton Watch Co., Lancaster, Pa. $1,066,000, Timers for cluster bomb adapters, Lancaster, Air Proving Ground Center (AFSC), Eglin AFB, Fla.

Collins Pipe Co., Inc., and Marwais Steel Co., Richmond, Calif. $1,749,400, Production of metal revetment kits for aircraft, Richmond, 2750th Air Base Wing (AFLC), Wright-Patterson AFB, Ohio.

27 AVCO Corp., Williamsport, Pa. $1,172,059, Expansion of production capability for components of CH-46A helicopters, Williamsport, Aeronautical Systems Div. (AFSC) Wright-Patterson AFB, Ohio.

Honeywell, Inc., Hopkins, Minn. $2,766,825, Production of aircraft ordnance, Hopkins Air Proving Ground Center (AFSC), Eglin AFB, Fla.

Curtiss-Wright Corp., Wood Ridge, N.J. $1,216,416, Production of crankshafts and components for the R 1820 series of aircraft engines, Wood Ridge, San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

Fairchild Hiller Corp., Farmingdale, N.Y. $1,782,340, Engineering services for the modification of the wiring system on F 105 aircraft, Farmingdale, Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

28 General Motors, Indianapolis, Ind. $26,546,200, T-56 aircraft engines and related equipment, Indianapolis, Aeronautical Systems Division (AFSC), Wright-Patterson AFB, Ohio.

M.I.T., Cambridge, Mass. $19,445,000, Research & development of advanced electronic programs including space communications, Cambridge Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

Collins Radio Co., Cedar Rapids, Iowa, $2,616,980, Production of communications equipment, Cedar Rapids, Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

Ryan Aeronautical Co., San Diego, Calif. $5,169,225, 100 target drones and related equipment, San Diego, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Cutler-Hammer, Inc., Deer Park, L.I., N.Y. $1,063,557, Work on airborne reconnaissance systems, Deer Park, (Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

General Electric, West Lynn, Mass. $8,027,803, Development program for T 64 12 engines for helicopters, West Lynn, Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

Maxson Electronics Corp., Great River, L.I., N.Y. $6,466,785, Fuze assemblies for aircraft bombs, Great River, Ogden Air Materiel Area, Hill AFB, Utah.

29 Stanley Aviation Corp., Denver, Colo. $1,317,462, Kits to modify Navy and Air Force A 1 aircraft with aircrew extractor escape systems, Denver, Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

Boeing Co., Seattle, Wash. Design and development of external bombs for supersonic aircraft, $2,982,760, Incentive contract for modification of B 52 aircraft flight control systems, Seattle, Air Proving Ground Center, Eglin AFB, Fla.

Lockheed Missiles and Space Co., Sunnyvale, Calif. $4,656,000, Launch services for the Agena rocket from April 1966 to Sept. 1967, Sunnyvale, Space Systems Division (AFSC), Los Angeles.

Marquardt Corp., Van Nuys, Calif. (1) $1,057,745, Non-hydrogen fueled supersonic combustion RAMJET engine; (2) $1,595,080, Analytical evaluation of advanced RAMJET propulsion systems, Van Nuys, Systems Engineering Group, Wright-Patterson AFB, Ohio.

Parsons Corp., Traverse City, Mich. $1,335,160, Compressor blades and related equipment for supersonic propulsion wind tunnels, Traverse City, Arnold Engineering Development Center, Arnold AFS, Tenn.

AVCO Corp., Wilmington, Mass. $2,875,500, Design development, fabrication, test and evaluation of the Minuteman Mark 11A re-entry vehicles, Wilmington, Ballistics Systems Division (AFSC), Norton AFB, Calif.

30 General Electric, West Lynn, Mass. $2,354,970, Aircraft engines for the T 38 and F 5 aircraft, West Lynn, Aeronautical Systems Division (AFSC), Wright-Patterson AFB, Ohio.

United Aircraft, East Hartford, Conn. $1,309,085, Spare parts for the J 57 aircraft engine, East Hartford, San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

Litton Industries, Inc., San Carlos, Calif. $1,200,000, Research & development of electronic amplifier type tubes, San Carlos, Systems Engineering Group, Wright-Patterson AFB, Ohio.

RCA, Moorestown, N.J. $4,565,000, Production of ground radar equipment, Moorestown, Air Force Western Test Range, Vandenberg AFB, Calif.

Northrop Corp., Hawthorne, Calif. $24,535,474, Production of T-38 aircraft, Hawthorne, Aeronautical Systems Division, (AFSC), Wright-Patterson AFB, Ohio.

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POSTAGE AND FEES P[illegible]

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Army, Air Force Test New Surfacing for Temporary Airfields and Heliports

While "instant airstrips" remain in the pipe dream stage, temporary tactical airfields and heliports may soon go on short-order lists of the Army and Air Force. A newly developed neoprene-coated surfacing membrane is expected to turn the trick. The material has been subjected to extensive field trials in the United States by the two Services and is being tested in Vietnam under combat conditions.

The Army Test and Evaluation Command (TECOM) has completed integrated engineering/service tests of the T-17 Airfield Surface Membrane. The tests were conducted at Fort Campbell, Ky., with TECOM's Armor-Engineer Board serving as the executive agency for the overall project. Engineering tests were conducted by the Army General Equipment Test Activity, Fort Lee, Va., another TECOM element, with the support of laboratories and technicians of the Army's Engineer Waterways Experiment Station, Vicksburg, Miss.

Aviation units were provided for the tests by the Army Aviation Test Board, a TECOM command located at Fort Rucker, Ala., and the USAF Tactical Air Command. The latter executed landings and take-offs with C-130 cargo aircraft while the board flew missions involving CV-2 and OV-1 aircraft.

The experimental material is intended for use in constructing stable dustproof and waterproof surfaces for temporary airfields. The accordion-folded panels, packaged in wood crates, are dispensed directly from cargo trucks. Alined and straightened by hand, each of the 78x100-foot panels is anchored to the ground with giant steel "tacks." Joints are constructed by overlapping adjoining edges and securing them in place with tack anchors and liquid adhesive to form waterproof seams. Side edges are fastened in V-trenches dug at the sides and ends of the emplaced surface. The ditches are then backfilled and compacted to form smooth shoulders. Surface repairs are made by positioning a piece of membrane under a damaged area and cementing it in place with adhesive.

A heavier surfacing, called the WX18 membrane, is being tested on the touchdown areas at each end of the Fort Campbell runway to determine if tears resulting from aircraft landings can be eliminated. If the WX18 material proves satisfactory, an airfield constructed with a combination of the two membranes should require virtually no maintenance.

Dollars Saved Thru Reduction In Top Secret Documents

The Defense Department reduced its Top Secret docum[illegible] inventory by 34 percent, the[illegible] realizing a cost avoidance sa[illegible] of an estimated $12[illegible],000 dur[illegible] the 12-month period beginn[illegible] April 1966. The reduction [illegible] lessened the risk of pos[illegible] compromise of sensitive inf[illegible]mation. This achievement [illegible] accomplished primarily thr[illegible] destruction (94 percent), [illegible] also through downgrading, [illegible] classification and transfer [illegible] Federal Records Centers.

During the period Janu[illegible] 15-March 15, 1966, the Milit[illegible] Departments and other comp[illegible]nents of DOD participated [illegible] the project for reducing inv[illegible]tories of Top Secret docume[illegible] This 60-day project was [illegible]proved by the Deputy Secret[illegible] of Defense based upon expe[illegible]ence gained by the Office of [illegible] Secretary of Defense. In a [illegible]day test ending in Novemb[illegible] 1965, OSD achieved a 33 perc[illegible] reduction of Top Secret ho[illegible]ings, thereby yielding an es[illegible]mated annual cost avoidance [illegible] over $5,000.

Participants reported th[illegible] this project caused all activi[illegible] to take a more deliberate int[illegible]est in keeping Top Secret do[illegible]ments to a minimum consist[illegible] with current requirements.

☆ U.S. Government Printing Office: 196[illegible]

DEFENSE INDUSTRY BULLETIN

Volume 2 No 8

August 1966

C. 1

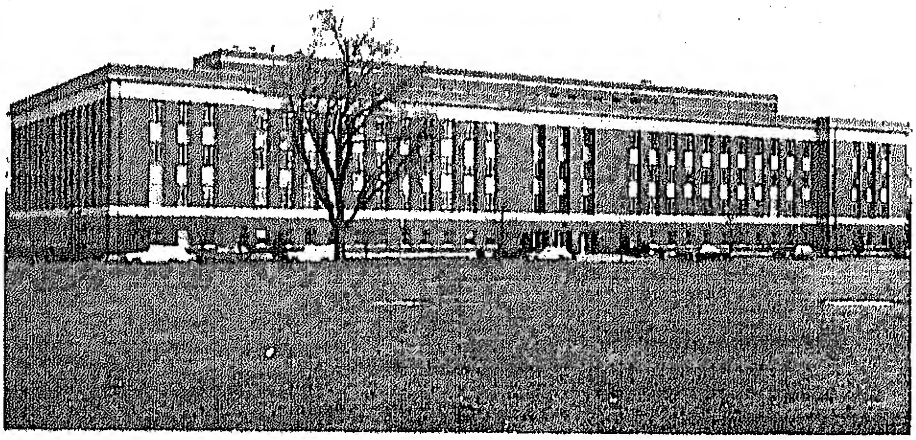
IN THIS ISSUE

DEPARTMENTS

DEPARTMENT OF DEFENSE

ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

The Industrial College of the Armed Forces



The Industrial College of the Armed Forces, in addition to preparing senior military officers and Government officials for high policy-making positions in the field of national security, has over the years conducted extension programs to educate military reservists and civilian executives located throughout the nation and the world.

In the article beginning on page 1, Major General William S. Steele, USAF (Ret.) describes the extension educational activities conducted by the college.

Study Under Way To Modernize Naval Shipyards

The Navy has initiated an engineered, long-range study to modernize all Naval shipyards with the exception of New York and Portsmouth. The New York yard was closed on June 30 and Portsmouth will be closed in 1975. A team of associated specialist companies, headed by Kaiser Engineers of Oakland, Calif., has been awarded a contract by the Naval Ship Systems Command to develop the study.

The Long Beach and Philadelphia Naval Shipyards have been named the two pilot yards involved in Phase I of the study, which includes assessment, analysis and recommendations to modernize all equipment and facilities.

Phase II will involve a similar study and recommendations for Charleston, Boston, Norfolk, Pearl Harbor, Puget Sound and San Francisco Bay Naval Shipyards.

Phase I is scheduled for completion in a 24-week period; an estimated 64 weeks will be required to complete the survey and submit the recommendations for all eight yards.

Rear Admiral W. F. Petrovic, Deputy Commander for Shipyards, Naval Ship Systems Command, Washington, D. C., is the Program Director for Shipyard Modernization, with Captain W. N. Ginn Jr., as Deputy Director. Commander W. B. Brantner is Technical Contracts Manager and Mr. H. R. Pyles is Technical Director.

Specialist companies associated with Kaiser Engineers on the project are: H. B. Maynard and Co., Pittsburgh, Pa.; The Raytheon Co., Burlington, Mass.; Gibbs and Cox, Inc., New York, N. Y.; Morris Guralnick Associates, Inc., San Francisco, Calif.; and National Steel and Shipbuilding Co., San Diego, Calif.

USAERDL Surveys Manufacturers of Physical Security Equipment

The management and support functions pertaining to the programming, budgeting and funding for all research, development, test and evaluation (RDT&E) of physical security equipment has been assigned to the Department of the Army by the Defense Department. Within the Army this responsibility has been redelegated to the Commanding Officer, U. S. Army Engineer Research and Development Laboratories (USAERDL), Fort Belvoir, Va.

A vital part of the program is the establishment and maintenance of an information analysis center for the collection, storage, retrieval and dissemination of technical data and/or information on physical security equipment. To accomplish this task, the USAERDL Scientific and Technical Information Division is con- [illegible]g an extensive survey of intrusion alarm and personnel iden- [illegible]ion systems in order to obtain all pertinent technical infor- [illegible] concerning these systems. Data and/or information [illegible] will be indexed and entered into a data bank to be made [illegible] all potential military users of physical security equip- [illegible]

[illegible] to over 200 manufacturers of physical [illegible] Manufacturers who did not receive a [illegible] and who wish to participate in this program can request a questionnaire from:

Chief, Scientific and Technical Information Division
USAERDL
Fort Belvoir, Va.

DEFENSE INDUSTRY BULLETIN

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

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(panding Horizons Through By-Mail Instruction: 1e New Look of Our Correspondence School

by
Maj. Gen. William S. Steele, USAF, (Ret.)

this nuclear age, more than ever 'e, our total resources and all of economic, social and Govern- al institutions have become in- ably tied to our quest for na- l security. The members of all s of our great nation Govern- industry, labor, education, the ssions, the military and the pub- large—must be well informed rticulate in the complexities of al security affairs if they are to their necessary parts effectively feguarding our way of life.

Industrial College of the Armed s, in addition to preparing senior ry officers and Government of- for high policy-making positions field of national security, has the years conducted extension ms to educate military re- ts and civilian executives located ghout the nation and the world. is regard, the Industrial Col- Correspondence Course has to be most effective. More than enrollees have successfully ted this graduate level course, t enrollment numbers about

nbers alone, however, do not re- he value of the course. Many pants either now occupy or will ove up to key positions in na- security affairs within the States and abroad.

ting Demands of Resources ion.

e policy makers face for- challenges in a world that has progressively turbulent since l of World War II. This tur- encompasses many "fronts"— ideological, strategic, geopo- economic and actual military . Its influence is all-pervasive. ates many of America's in- affairs and almost all of our l affairs. On the domestic side, bulence renders the preserva- a strong and viable economic absolutely mandatory if the States is to maintain and enhance its position as leader of the Free World.

Relations with Western Europe and the emerging nations of the world are affected. So are tariff and trade questions; foreign economic, military and technical aid; programs of cultural exchange and information dissemination; and our participation in the United Nations and other international efforts looking toward the reduction of world tensions.

In the face of rapid technological progress by potential enemies, the United States has had to give increasing attention to the development of new weapons, to scientific research and to space technology. The pressure of armed conflict in Vietnam has compelled the United States to build up flexible military forces and commit increasing numbers of these forces to the battlefield.

These developments involve policies and action programs which lay heavy claims on America's resources, which are vast but finite. The central challenge is how to reconcile conflicting demands and best allocate available

Maj. Gen. William S. Steele, USAF, (Ret.), former Deputy Commandant of the Industrial College of the Armed Forces, is now serving as a consultant and member of the Board of Advisors for the Industrial College. Gen. Steele retired from the Air Force July 31 after 30 years of active service.

resources in support of immediate and long-range national security programs.

The management of logistic resources has become a gigantic business, demanding the increased use of high-speed digital computers and the application of the highest levels of professional knowledge on a rapidly accelerating basis. The broadening of this knowledge among our potential high-level decision makers through advanced education in Defense management has become a primary concern of our top national security planners.

Capstone of Defense Management Education.

It is the purpose of the Industrial College of the Armed Forces to focus on the critical issues and persistent problems in this field. From its inception in 1924, the Industrial College has had a distinctive educational role in resource management. Operating under the direction of the Joint Chiefs of Staff, the college stands today as "the capstone of our military educational system in the management of logistic resources for national security." Its present charter specifically directs the college to "conduct courses of study in the economic and industrial aspects of national security and in the management of resources under all conditions, giving due consideration to the interrelated military, political and social factors affecting national security, and in the context of both national and world affairs in order to enhance the preparation of selected military officers and key civilian personnel for important command, staff and policy-making positions in the national and international security structure."

At Fort Lesley J. McNair, Washington, D.C.—home base of the Industrial College—the Resident Course provides the testing ground for innovations in educational methodology and for new concepts in Defense management.

This 10-month course—the core of the College's three-part program—is now offered each year to 180 carefully selected senior military officers and Government officials. At the close of the 1965-66 academic year, 2,925 officers and civilians, representing all major areas of functional, command and technical responsibility in the Military Services and civilian agencies, had completed this course since 1946, when the name of the college was changed from the Army Industrial College to its present designation as the Industrial College of the Armed Forces.

These resident students share a rare experience. Shedding their various service uniforms and preconceptions, they study together in small-group learning situations and exchange ideas and experiences in an atmosphere of complete academic freedom. The program is fast moving and intensive. Recognized leaders from all sectors of the economy and the Government appear before these students on the auditorium platform and in seminars. Giving generously of their time and talent, these visiting speakers and panelists point up what has succeeded, faltered, or failed in the past and recommend what, in their judgment, is needed for the nation's well-being and defense in the present world setting.

Two extension-type educational activities are conducted for those who cannot attend in residence. The first of these is the National Security Seminar program, in which officers from the military components of the college faculty conduct a series of two-week seminars each year in selected cities throughout the nation. Bringing together selected senior reserve officers and representatives of the local business and the academic and civic community, these seminars have contributed much to supplementing the conferees' backgrounds and their understanding of the crucial issues relating to our national security. As of June 30, 1966, a total of 279 seminars had been completed in 157 cities with a total enrollment of more than 166,000 military and civilian conferees.

Fundamental Improvements in Correspondence Course.

It is my purpose here to focus attention on the far-reaching and fundamental improvements the college is currently making in the third element of its three-part program—the world-wide Correspondence Course, which, until last December, was entitled "The Economics of National Security." In that month a new name—"National Security Management"—was adopted to more clearly reflect the course content and purpose. The current program of intensive curriculum and textbook revision places greater stress on Defense management and on an examination of the policy-making and administrative mechanisms, programs, policies and managerial tools employed in harnessing the Nation's resources for national security.

Established in 1950, the Correspondence Course has evolved as an off-post replica of the Resident Course. Using its own specially-tailored textbooks and tested methods of instruction, the Correspondence School extends the essence of the resident program to active and reserve officers, Federal Government employees, business executives and selected foreign students. The director of the school is Captain Gordon F. Smale, USN, a former member of the Resident School faculty.

Here, indeed, is an extraordinary opportunity for qualified officers and civilians, in and out of Government, to gain a deeper appreciation of the central problems in the managemen of logistic resources and of the eco nomic and industrial aspects of na tional security. The Correspondenc Course curriculum is presented in 2 small bound volumes, presently orga nized into five progressive and inter related units of study.

A "Foundations" unit (Unit I) in cludes an introductory survey of th entire course, highlights of basic ec nomics, a broad exposition of the mai instruments of the Federal Govern ment and of the processes involved i the formulation of our national se curity objectives and policies, and th basic concepts and practices of mo ern-day management both in the Go ernment and in the business an industrial world.

Unit II, "The Resources Base fo National Security," comprises fi texts which analyze the manageri and substantive problems in harnes ing our resources—human, materia energy, industrial, transportation, uti ity, and scientific and technological- for the nation's well-being and secu ity.

Unit III, "Defense Logistics Ma agement," presents, in four volum and in depth, the central problems requirements, procurement and pr duction, and supply manageme

Dr. Harry B. Yoshpe, Chief, Textbook Development Group, The Industr College of the Armed Forces.

throughout the Defense Establishment.

The theme of Unit IV, "Foreign Aspects of National Security," is presented in five volumes which take the student through the international arena, the intelligence community, U.S. foreign economic policy, mutual security and the ideological struggle for men's minds.

The concluding unit, "Plans and Programs for National Readiness," (Unit V) includes four volumes which highlight the administration of the economy in World War II, the methods, past practices and current planning of emergency economic stabilization measures; the nature and scope of the problems anticipated in the event of a nuclear attack on the home front and the preparedness measures that are being taken to deal with these problems; and, finally, the Communist aims and inroads among the emerging nations and the U.S. response to this challenge through its military and technical assistance and related civic action, community development and public safety programs.

Textbooks—The Life-Blood of Correspondence Study.

Always a basic medium of instruction, textbooks occupy a particularly important place in the college's Correspondence Course. While the Resident Course permits many study techniques—auditorium presentations, seminars, group discussions, simulation exercises and varied reading assignments, the correspondence student is largely confined to his textbooks. The effectiveness of the course depends entirely upon the quality of the texts. The impersonal nature of the instruction and the high caliber of the enrollees demand the best presentation possible of the facts and thinking in the national security management field. It is essential that there be at all times a comprehensive, perceptive and well-balanced set of textbooks, properly keyed to the special needs of correspondence instruction. The central problem is to insure that this important body of educational literature is kept abreast of the rapidly changing national security picture, is in complete harmony with the scope and emphasis of the Resident Course, and is pedagogically sound.

From the inception of the correspondence program, it has been the policy of the college to place primary reliance on "in-house" development of textbooks. A small Textbook Development Group in the Correspondence School serves as the focal point for leadership, guidance and direction to the program; provides direct, concentrated and professional application to the task; and insures the synchronization of the correspondence curriculum with the Resident Course. This group is headed by Dr. Harry B. Yoshpe, Professor of National Security Affairs, a member of the Industrial College faculty since 1961.

In carrying out its responsibilities, the group draws vital support from the Resident School and other components of the college faculty. Outside specialists are brought in for consultations and for reviews of drafts or published texts. Where practicable or necessary, other Government-agency officials and outside scholars contribute directly to the development of texts. Authorization is also obtained to reprint appropriate published materials.

Through these efforts, there has emerged a body of educational literature—popularly referred to as "bluebooks"— that is distinctly the product of the Industrial College. Through these texts the college carries out its policy of basing correspondence instruction on the Resident Course.

The textbook writers take advantage of the unique know-how and resources within the college. A basic program exists for promoting the professional standing of the faculty and better equipping them for their essential contributions to the college program. The college, in turn, gains from the prestige and higher professional attainments of its faculty.

In its approach to the job, the Textbook Development Group maintains exacting standards. It seeks not dry, ponderous, encyclopaedic narrations of detail, but vibrant and interpretative syntheses which are informative and at the same time good reading. The texts must be penetrating, provocative and scholarly, but not pedantic or ornate. They must be accurate, concise and analytical. Along with commitment to objectivity and adequate coverage of all important subject matter, care is taken to insure freedom from excessive redundancy within any particular text and to achieve maximum unity, balance and cohesiveness of the entire series.

Like the civilian faculty in the Resident School, the professional members of the Textbook Development Group hold professorial rank. Their formal resident teaching and other cross-college commitments are deliberately kept light, however, to allow them ample time for their basic research and writing tasks.

The texts are in use in hundreds of libraries throughout the United States and in 51 friendly foreign countries, including foreign war colleges. Of the 22 course volumes, 20 have been translated into five languages: Spanish, Portuguese, French, German and Chinese. One volume is being translated into Japanese. Five nations—Argentina, Brazil, Ecuador, Peru and Venezuela—have incorporated the major portions of the course into their military educational systems.

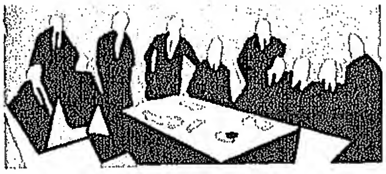
Tackling Obsolescence.

In its efforts to meet the needs of correspondence instruction, the Textbook Development Group has faced up to the one chronic problem—obsolescence. The Correspondence School curriculum is reviewed and revised each year on the basis of a three-year planning cycle. With the volumes now in the system and under development, the problem of obsolescence should be less formidable than was the case previously. But events and the lead-time in textbook development, revision and publication will inevitably create a lag in the program.

To help offset this problem, the Correspondence School publishes and disseminates to its students an annual *National Security Management Review*. Initiated in the early summer of 1965, this "yearbook" highlights for the student the latest trends, events and problems in major aspects of the course. It brings together a wealth of near-current information in tight space, in sharp focus and in forceful style for ease of understanding and ready use. At the same time, the materials in these annual reviews, tailored and keyed to the texts in the National Security Management series, prove invaluable in updating particular texts as they are taken up in the scheduled revision and development cycle.

Over and beyond the annual reviews and the normal cyclical revision

(Continued on Page 21)



MEETINGS AND SYMPOSIA

SEPTEMBER

U.S. National Committee for Pure and Applied Biophysics in connection with the Second International Biophysics Congress, Sept. 5-9, in Vienna, Austria. Sponsor: Office of Naval Research, Contact: Mrs. P. H. Tenniswood, (Code 444), Office of Naval Research, Washington, D.C. 20360. (Area Code 202) OXford 6-1538.

Symposium on Galio-Marinide, Sept. 26-27, in Wales and England. Sponsor: Research and Technology Div., AFSC. Contact: R. W. Runnells (AVN), Air Force Avionics Laboratory, Research and Technology Div., AFSC, Wright-Patterson AFB, Ohio 45433. (Area Code 513) 253-7111, ext. 5-3802.

Sixth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Sept. 26-28, at Princeton, N. J. Sponsor: Naval Air Turbine Test Station. Contact: Dennis A. Wysocki, Conference Vice Chairman, Naval Air Turbine Test Station, P.O. Box 1716, 1440 Parkway Ave., Trenton, N. J. 08607. (Area Code 609) 882-1414, ext. 355.

Sixth Symposium on Naval Hydrodynamics, Maneuverability, Waves and Physics of Fluids, Sept. 29-30, Oct. 3-4, at Washington, D. C. Sponsor: Office of Naval Research. Contact: Mrs. S. W. Doroff, Office of Naval Research (Code 438) Washington, D. C. 20360. (Area Code 202) OXford 6-1433.

OCTOBER

Tenth Annual Organic Chemistry Conference, Oct. 4-5, at Natick, Mass. Co-sponsors: Army Natick Laboratories and the NAS-NRC Advisory Board on Military Personnel and Supplies. Contact: Louis Long Jr., Head, Organic Chemistry Laboratory, Army Natick Laboratories, Natick, Mass. (Area Code 617) 653-1000, ext. 414.

Colloquium on the Photographic Interaction Between Radiation and Matter, Oct. 26-27, at Washington, D. C. Co-sponsors: Air Force Office of Scientific Research and the Society of Photographic Scientists and Engineers. Contact: Dr. Amos G. Horney (SRC), Air Force Office of Scientific Research, Washington, D. C. 20333. (Area Code 202) OXford 6-8705.

NOVEMBER

Ship Control System Symposia, Nov. 15-17, at Annapolis, Md. Sponsor: USN Marine Engineering Laboratory. Contact: Walter J. Blumberg, Steering Committee Chairman, USN Marine Engineering Laboratory, Annapolis, Md. (Area Code 301) 268-7711, ext. 8670.

Fifth Annual Symposium on Physics of Failure in Electronics, Nov. 16-18, at Columbus, Ohio. Co-sponsors: Battelle Memorial Institute and the Rome Air Development Center. Contact: Joseph Schramp (EMERP), Rome Air Development Center, Griffiss AFB, N. Y. 13442.

Third Congress on Information Systems Science and Technology, Nov. 21-22, at Buck Hills Falls, Pa. Sponsors: Electronic Systems Div., (AFSC) and MITRE Corp. Contact: Col. C. A. Laustrup (ESRC), Project officer, Electronic Systems Div., AFSC, L. G. Hanscom Field, Bedford, Mass. 01731. (Area Code 617) CR 4-6100, ext. 4527.

Symposium on the Structure of Surfaces, date undetermined, at Durham, N. C. Sponsor: Army Research Office-Durham. Contact: Dr. H. M. Davis, Director, Metallurgy and Ceramics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706. (Area Code 919), 286-2285, ext. 31.

AFA Annual Meeting To Include Industry Briefing Program

Some 39 companies will conduct special briefings on 54 different aerospace and defense subjects at the Air Force Association 1966 Fall Meeting to be held at the Sheraton Park Hotel in Washington, D.C., Sept. 14-16. The briefings will cover advanced aircraft, propulsion technology, space tools, escape systems, communications, guidance systems, composite materials, V/STOL and many other subjects.

This is the third year that the Association has staged this type of program, which combines short and informative company presentations with displays of hardware. Three major features make up the AFA briefing program. First, a summary of each company's proposed presentation is reviewed by a special Military/Government technical advisory committee to determine the quality and educational value of the presentation. Second, the audience is assembled into small parties and escorted to each of the presentations on a specific schedule. Third, those participating in the morning briefings attend an Association luncheon and those participating in the afternoon briefings are invited to attend an Association reception.

Each company session is allocated exactly 20 minutes of which 15 is for the presentation, three for questions and answers, and two for the party to move to its next briefing location.

Invitations are issued to representatives from more than 40 Government departments, agencies, offices and installations. Bus transportation to and from the hotel is arranged to accommodate attendants. Between 2,500 and 3,000 persons have taken part in the program each year.

AUSA Schedules Annual Meeting

The Association of the United States Army (AUSA) will hold its 12th annual meeting Oct. 10-12 at the Sheraton-Park Hotel in Washington, D. C.

Speakers for this year's meeting will include Secretary of the Army Stanley R. Resor; General Harold K. Johnson, U. S. Army Chief of Staff; Lieutenant General Bruce Palmer, Commanding General, XVIII Airborne Corps; Major General Harry W. O. Kinnard, Deputy Assistant Chief of Staff for Force Development; and Colonel Spurgeon Neel, former Surgeon for Military Assistance Command, Vietnam; and others.

Former President Harry S. Truman has been selected to receive the George Catlett Marshall Medal, AUSA's highest award. Presentation will be at the George Catlett Marshall Memorial Dinner on the evening of October 12.

AUSA president, Elvis J. Stahr, former Secretary of the Army, will host a reception for all registrants honoring the Secretary of the Army and the Chief of Staff on the evening of Oct. 10. The Annual Luncheon honoring the Army's Senior Commanders, will be held on Oct. 11.

More than 90,000 square feet of military and industrial exhibits will be on display at the meeting site. Some 27 Army agencies and commands have been assigned space along with 55 industrial concerns.

DEPARTMENT OF DEFENSE

Kirk H. Logie has been selected as Chief of the newly-established Armed Forces News Bureau in Washington, D.C. The News Bureau operates as a field activity of the Directorate for Armed Forces Information and Education within the Office of Asst. Secretary of Defense (Manpower).

Bernard B. Lynn has been selected to succeed Edward T. Cook as Dep. Dir. of the Defense Contract Audit Agency. Cook retires Aug. 5. James Ruttenberg will replace Lynn as Deputy for Audit Management.

Dr. Samuel J. Rabinowitz has been designated Acting Deputy Director of the Advanced Research Projects Agency. He replaces Dr. Robert A. Frosch who has been nominated for assignment as Asst. Secretary of the Navy (Research & Development).

Dr. Donald M. MacArthur has been appointed as Dep. Dir. (Chemistry and Materials), a recently created position in the Office of the Director, Defense Research & Engineering.

Maj. Gen. John A. Goshorn, USA, has been named Dep. Dir. for Contract Administration Services, Defense Supply Agency. He succeeds Maj. Gen. William W. Veal, USAF, who has been reassigned to Wright-Patterson AFB, Ohio.

RAdm. William E. Lamos, USN, has been designated Dir., Far East Region, Office of Asst. Secretary of Defense (International Security Affairs). The assignment became effective July 16.

RAdm. William N. Leonard, USN, has been assigned as Asst. Dir. (Operational Test and Evaluation), Office of the Dep. Dir. (Administration and Management), Office of the Dir., Defense Research & Engineering.

Col. Grover Heiman Jr., USAF, has been named Chief, Magazine and Book Branch, Office of Asst. Secretary of Defense (Public Affairs). He replaces Col. C. V. Glines, USAF, who has been assigned as Chief, Public Affairs, Alaskan Command.

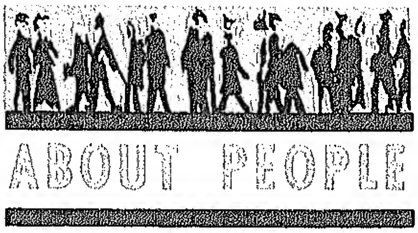
Capt. Joseph S. Burkle, MC, USN, has been appointed Dir. of the Armed Forces Radiobiology Research Institute in Bethesda, Md.

Col. James T. Brennan, MC, USA, Dir. of the Armed Forces Radiobiology Research Institute for the last five years, retired from military service June 30.

Col. Gerald Johnson Jr., USA, has been named Dir. of the Defense Contract Administration Services Region, Philadelphia, replacing Col. William S. Collinson, USAF, who is retiring.

DEPARTMENT OF THE ARMY

General Harold K. Johnson, U.S. Army Chief of Staff, was awarded the Distinguished Service Medal, the Army's highest non-combat award, during ceremonies at the Pentagon July 13. Gen. Johnson was cited for meritorious service in a position of



great responsibility as Army Chief of Staff from July 1964 to July 1966.

The Chief of U.S. Army Engineers has announced the establishment of a new position of Chief Topographer in his office and the appointment of Archer Wilson to that position.

Maj. Gen. Charles Billingslea, Dep. Commanding General of the U.S. Army Combat Developments Command, Fort Belvoir, Va., has retired from service.

Col. Eugene J. McGinnis has been named the new Dir. of the Army Missile Command's Procurement and Production Directorate at Redstone Arsenal, Ala.

Col. Reuben Mundy, Dir. of the Army Missile Command's Missile Intelligence Directorate, has retired. He has been replaced by Col. Thomas A. Rodgers.

Col. Ben Harvey Jr., has assumed duties as Dir., Evaluation Directorate, U.S. Army Combat Development Command, Fort Belvoir, Va., relieving Col. William H. Vail Jr.

DEPARTMENT OF THE NAVY

RAdm. Ben. W. Sarver assumed the office of Vice Commander, Naval Ordnance Systems Command on July 1. He comes to the assignment from duty as Dir. of the Surface Missile Systems Project, Office of Naval Material.

RAdm. Jackson D. Arnold is slated to relieve RAdm. Frank C. Jones as Dep. Chief of Naval Material (Logistics Support) in September. Adm. Jones will be reassigned to the Ship Systems Command.

Maj. Gen. Keith B. McCutcheon, USMC, has been assigned as Dep. Chief of Staff (Air) at Marine Corps Headquarters.

Capt. Frederic W. Corle, who has been selected for promotion to the rank of rear admiral, has been relieved as Commanding Officer, Navy Electronics Supply Office, Great Lakes, Ill. by Capt. W. F. Harvey Jr. Capt. Corle has been reassigned as Commanding Officer, Naval Ships Parts Control Center, Mechanicsburg, Pa.

Capt. John W. Wade has been assigned duties as Dep. Commander, Naval Supply Systems Command (Transportation).

Capt. C. W. Pittman Jr. has relieved Capt. F. M. Blanchard as Commanding Officer, Naval Air Technical Services Facility, Philadelphia.

The Naval Facilities Engineering Command (NFEC) announces the following command assignments:

Capt. Henry J. Johnson relieved Capt. William E. Davidson as Dep. Dir., NFEC, Pacific Div. Capt. John D. Burky became Commanding Officer of the Naval Construction Battalion Center, Davisville, R.I., replacing Capt. Joseph H. Barker Jr., who retired.

Capt. Davidson took command of Capt. Burky's former post as Commanding Officer, Western Div., NFEC. Capt. Ralph B. Grahl assumed command of the Public Works Center, Guam, relieving Capt. Harry Stevens Jr., who took Capt. Johnson's former post as Commanding Officer of NFEC Eastern Div. Capt. Bernard O. Roessler reports as Commanding Officer of the Public Works Center, Newport, R.I. He replaces Capt. Richard T. Pratt who has retired.

Capt. Albert R. Marschall will relieve Capt. Nelson R. Anderson as Commander of the 30th Naval Construction Regiment. Capt. Bryan S. Pickett will relieve Capt. Joseph W. Frorath as Commanding Officer, Northwest Div. NFEC. Capt. Frorath will relieve Capt. John A. Stelger as Dep. Commander, Atlantic Div. NFEC. Capt. Stelger will retire.

DEPARTMENT OF THE AIR FORCE

Maj. Gen. Ben I. Funk, Commander of Space Systems Division, Air Force Systems Command, will retire Sept. 1. He will be replaced by Brig. Gen. Paul T. Cooper.

Maj. Gen. William W. Veal returned to duty with the Air Force Logistics Command Aug. 1, replacing Brig. Gen. William G. Lee Jr., as Dir. of Plans and Programs at AFLC headquarters. Gen. Lee has retired.

Maj. Gen. C. B. Root, Mobile Air Material Area Commander, will retire from active military service in October. He has served at Mobile since Feb. 1, 1965.

Maj. Gen. Richard S. Abbey has been assigned as Asst. Chief of Staff for Reserve Forces at USAF headquarters.

Brig. Gen. Robert C. Richardson III, Dep. Chief of Staff (Science & Technology), AFSC headquarters, is scheduled to become Dep. Commander, Defense Atomic Support Agency Field Command, Sandia Base, N.M.

Brig. Gen. William R. Yancey, Vice Commander, Aeronautical Systems Div., (AFSC), is scheduled for retirement on Sept. 1.

Col. Louis O. Adler has been reassigned to the Air Force Systems Command as Dep. for Special Contracts in the Office of the Dep. Chief of Staff (Procurement Production).

Col. Edward H. Robertson has been assigned as Chief, Procurement Office, Space Systems Div. (AFSC), Los Angeles.

REMOTE COMPUTING

Electronic Data Processing Progress in the Innerspace/Aerospace Navy

by

Cdr. Eugene Gralla, SC, USN

Early in 1964 the Management Information Division, Office of Naval Material, conceived an idea which later was approved and elevated to quasi-project status by the Deputy Chief of Naval Material, Rear Admiral R. L. Shifley. He directed Management Information Division to "connect remote communications units to a Navy-owned, large-scale computer for a rapid reply system to solve day-to-day engineering problems."

This "go" sign fired a previously designated study group to such a degree that today turn-around time in the solution of engineering problems has been slashed downward from approximately four days to four hours or less. Within the next several months, it is envisioned that the "Remote Computing/Time Sharing" methodology currently being pursued by the Navy will provide the media to solve engineering/scientific problems almost immediately.

This current ADP endeavor becomes another first in pioneering efforts in electronic data processing in the Navy—an effort that had its beginning in the mid-fifties at research facilities in eastern universities followed by actual operation of a prototype computer at the Aviation Supply Office in Philadelphia.

At the completion, then, of a period of about 15 years experience, remote computing becomes the ultimate in ADP advancement to bring Navy's vast inventory of computational ability closer to the personnel requiring its services. In this manner, the Navy's computers become available simultaneously to serve many users in solving many different problems.

In Retrospect.

Initially, the Remote Computing Study Group, sponsored by the Chief of Naval Material (CNM), decided that only one of three laboratories in the Washington, D.C., area involved in the project would be used to explore the vast potential of remote problem solving and to evaluate the testing. However, each of the three laboratories providing membership on the study group—namely, Naval Ordnance Laboratory, White Oak, Md.; the Naval Weapons Laboratory, Dahlgren, Va., and the David Taylor Model Basin, Carderock, Md.—volunteered.

It was then decided that each laboratory would jointly participate by developing its own capability and, after full operation, advance the project goals from there. In subsequent weeks the study group launched into a nine-point program to:

- Designate "prototype" laboratories.
- Train engineers in the use of simplified programming.
- Develop standard programs for repetitive problem calculations.
- Install remote devices "off-line" to the activity's computer to provide easier access for engineers.
- Solve small engineering routines faster and at lower cost.
- Utilize available computer time to the fullest.

Cdr. Eugene Gralla, SC, USN, is Head of the Information Systems Design and Control Branch of the Management Information Division for the Chief of Naval Material.

- Extend the project to othe laboratories in the general area.
- Modify or replace the presen computers to permit remote device "on-line."
- Expand the concept Navy-wide

Examples of Today's Progress.

A few noteworthy examples of th Navy's current advancement and us of the Remote Computing ADP Tech nique are:

- Naval Weapons Laboratory, Dahl gren. The Naval Weapons Laborator (NWL), Dahlgren, Va., has the mis sion task and Navy responsibility t "conduct theoretical and experiments studies of computing machines an machine components, and of more ad vanced and effective means of compu tation as well as analyses, evaluation and design of data processing sys tems." Consequently, NWL Dahlgre was vitally concerned and initiated research approach in remote comput ing. This undertaking was to enabl NWL Dahlgren to evaluate direct access computing concepts experi mentally by utilizing both existin systems and a NWL research system

Preliminary work with existin systems has been useful. Today, how ever, at NWL Dahlgren most effort are being concentrated on the NWI pilot system, which, when operationa can be used Navy-wide.

To accelerate its pace and step u its ADP research, NWL Dahlgren ha installed one of the first modula "third generation computers." Thi newly advanced equipment has re cently been augmented with user ter minals to include cathode ray tub displays, light pens, alphanumeri keyboards and function keyboards.

Plans for this facility include th use of general purpose language such as FORTRAN, console commu nication languages, display-oriente languages such as those for analo simulation and symbol manipulatio

Within the next few months, a sys tem which will run under an ele mentary monitor, and which will time share the two consoles with a back ground problem is expected to be op erational. There will initially be tw user languages. One, called AA (Analyst Assistance Program), is partial subset of FORTRAN and i intended mainly as a computation aid for exploratory analysis; th other is an analog simulation lar guage. AAP will permit the user t

compose, modify, or use parts of a program via the light pen. The values of the variables and the function and codes available are visually presented on the cathode ray tube (CRT) display.

• Development of Graphic Programs at NWL Dahlgren. Work is currently under way on the development of a collection of graphic programs to be used either separately or incorporated in a display-oriented conversational FORTRAN system which is presently under development. Work on symbol manipulation (a procedure for the use of formal mathematics in the solution of differential equations or the algebra of series) is presently being continued as a separate phase; the specifications for its implementation have not yet been fully determined.

The overall project objective is to improve the usefulness of the computer as a tool for mathematicians, scientists and engineers. This can be done by providing them with direct access to a large, time-shared computer system, thereby improving the response time and permitting the user to make on-line decisions that otherwise would have to be pre-programmed, sometimes at considerable expense and sometimes not possible. Results of this pilot study of terminals, languages, graphic displays, etc., are expected to be an invaluable aid in the development of very large operational time-shared systems for use at Dahlgren and other similar laboratories.

• Navy Automated Research and Development Information System (NARDIS). NARDIS is an information system under the direction of the Chief of Naval Research and supported by the Office of Naval Research, Bureau of Ships and the Bureau of Naval Weapons. The system's basic objective is to establish and maintain a common data bank of scientific, technical and administrative information on all Navy-sponsored research and development. This data bank may be used as a prime source of RDT&E information by all military, management, scientific and technical echelons of the Navy.

Future developments for NARDIS will be oriented toward a real-time system with remote control features. Plans for these developments are evolving and will come to fruition once the present computer system has been well established and evaluated. It is anticipated that plans for future development of NARDIS will incorporate and emphasize random access devices such as disc files, drums, etc. In addition, plans will include remote control features which will permit the user to communicate with and query the NARDIS data bank from his location.

• U.S. Naval Academy, Annapolis. Within weeks the midshipmen may find their problem solving made easier. Remote terminal equipment tied into a computer center will enable the faculty and student body to use the most effective methods and the great potential afforded by ADPE.

Of current and particular interest at the academy is the contribution that the remote computing methodology might make to the 3,500 midshipmen in the modern and rapid solution of assigned mathematical problems.

Remote Computing Timetable.

The original phasing of the timetable to achieve the objectives of the potential of remote computing within the Naval Material Support Establishment was as follows:

• Phase I. Off-line stacking of small scientific/engineering jobs (usually programmed by the personnel requesting the services) for batch processing several times per day, through a large size computer, to permit four-hour or less turn-around time to the user.

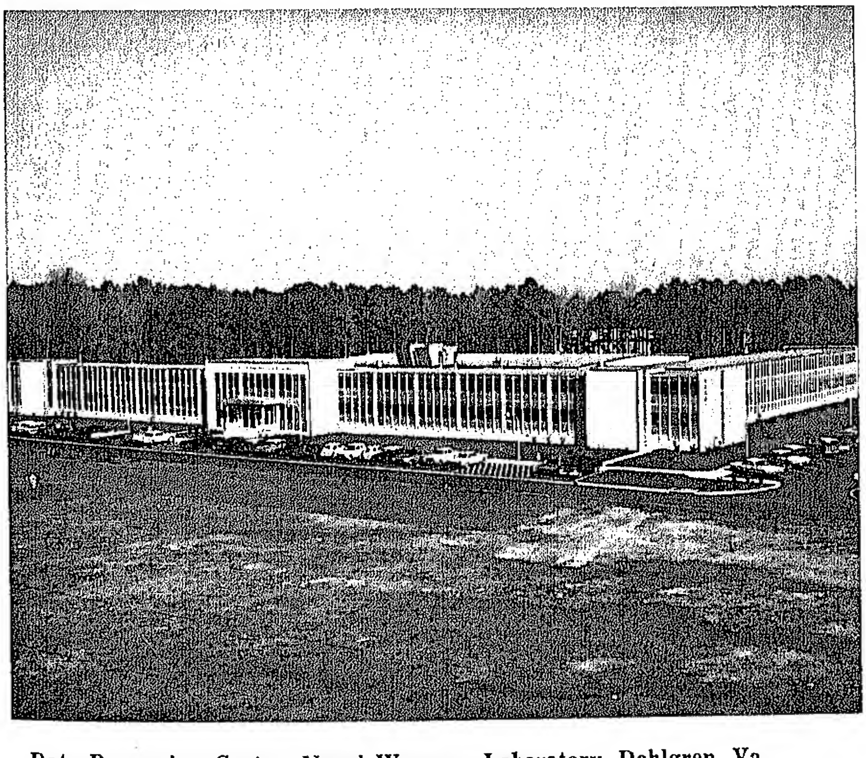
• Phase II. Use of a small size computer to test the economic feasibility of several types of remote terminals which concurrently process small scientific/engineering applications including programming preparation.

• Phase III. Use of a medium size computer to process small scientific/engineering applications from remote terminals concurrently while simultaneously processing a direct user small background program.

• Phase IV. Use of a large size computer or multiple Central Processing Unit (CPU) system to productively process a large scientific background program simultaneously with several small scientific/engineering programs entered from numerous and various types of input/output remote terminals located in-house and at other Navy activities. This would be the start of the Scientific/Engineering ADPS Service Center.

• Phase V. Use of a large size computer or multiple CPU system to process productively a large business background program simultaneously

(*Continued on Page 13*)



Data Processing Center, Naval Weapons Laboratory, Dahlgren, Va.

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OCTOBER 1966

SPEAKERS CALENDAR

DEPARTMENT OF THE ARMY

Gen. Frank S. Besson Jr., Commanding General, Army Materiel Command, at 21st Annual Transportation and Logistics Forum, National Defense Transportation Association, Dallas, Tex., Sept. 20.

DEPARTMENT OF THE NAVY

RAdm. R. L. Shifley, Vice Chief of Naval Material, at Armed Forces Staff College, Norfolk, Va., Sept. 8.

RAdm. A. R. Gralla, Commander Naval Ordnance Systems Command, at Underwater Warfare Seminar, Newport, R.I., Sept. 12.

RAdm. Pierre Charbonnet, Commandant, 8th Naval District, at Hot Springs Navy League Council, Hot Springs, Ark., Sept. 13.

RAdm. Jack S. Dorsey, Commandant, 6th Naval District, at South Carolina Buttonhole Club, Greenville, S.C., Sept. 13.

RAdm. J. P. Sager, Asst. for Material Acquisition, Naval Air Systems Command, at Logistics Management Symposium, Huntsville, Ala., Sept. 13.

RAdm. E. F. Metzger, Commanding Officer, Navy Supply Center, Oakland, Calif., at National Defense Transportation Assn. Meeting, Dallas, Tex., Sept. 19.

RAdm. Henry H. Caldwell, Commander, Fleet Air Jacksonville, at Douglas Management Club Meeting, Sacramento, Calif., Sept. 21.

VAdm. I. J. Galantin, Chief of Naval Material, at Navy-Industry Material Reliability Conference, Shoreham Hotel, Washington, D.C., Oct. 26; at American Society of Naval Architects and Marine Engineers, Hilton Hotel, New York City, Nov. 11.

DEPARTMENT OF THE AIR FORCE

Hon. L. Marks Jr., Asst. Secretary of the Air Force, (Financial Management), at CPA Society Meeting, Los Angeles, Calif., Sept. 12.

Hon. Harold Brown, Secretary of the Air Force, at AFA Anniversary Banquet, Washington, D.C., Sept. 16.

Gen. J. P. McConnell, Chief of Staff, U.S. Air Force, at AFA Anniversary Banquet, Washington, D.C., Sept. 16 at Defense Orientation Conferenc Assn. Meeting, Washington, D.C. Sept. 30; at American Ordnance Assn Meeting, Los Angeles, Calif., Oct. 5-6 at International Congress on Ai Technology, Hot Springs, Ark., Oct 28.

Gen. G. P. Disosway, Commande Tactical Air Command, at Chambe of Commerce, Oklahoma City, Okla Sept. 16.

Maj. Gen. H. E. Humfeld, Commander, 1st Strategic Aerospace Div Strategic Air Command, at Nationa Security Industrial Assn. Meeting Vandenberg AFB, Calif., Sept. 23.

Maj. Gen. G. F. Keeling, Deput Chief of Staff, Procurement and Pro duction, Air Force Systems Command, at National Security Industria Assn. Meeting, L. G. Hanscom Fiel Mass., Sept. 23.

Maj. Gen. H. B. Manson, Commander Air Force Flight Test Center, Edwards AFB, Calif., at Trad Club Meeting, Bakersfield, Calif Oct. 19.

CALENDAR OF EVENTS

Aug. 23–24: Procurement Conference in conjunction with the Sixth Annual Maine Products Show, Portland, Maine. Contact: Clarence F. McKay, Maine Department of Economic Development, State Office Building, Augusta, Maine.

Sept. 2–3: Canadian International Air Show, Toronto, Ontario, Canada.

Sept. 5–11: National Championship Air Race, Reno, Nev.

Sept. 8–9: Business Opportunities Conference, Milwaukee, Wis. Contact: Lee Berndt, Executive Secretary, Metropolitan Jaycees, 2000 13th Ave., Milwaukee, Wis.

Sept. 11–16: American Chemical Society Meeting, New York City.

Sept. 13–15: National Security Industrial Assn.-U.S. Air Force Electronics Conference (Secret), Murray Hall, U.S. Naval Station, Boston, Mass.

Sept. 14: Procurement Conference, Rochester, N.Y. Contact: Rochester Chamber of Commerce, 55 St. Paul St., Rochester, N.Y.

Sept. 14–16: Air Force Assn. Aerospace Development Briefings/Displays, Sheraton Park Hotel, Washington, D.C.

Sept. 17–18: Midwestern Aviation & Space Exposition, Willow Run Airport, Detroit, Mich.

Sept. 18–21: National Defense Transportation Assn. Meeting, Dallas, Tex.

Sept. 18–21: American Institute of Chemical Engineers Meeting, Atlantic City, N.J.

Sept. 18–22: American Society for Industrial Security Meeting, Philadelphia, Pa.

Sept. 19–20: Government-Industry Procurement Conference, Portland, Ore. Contact: S. H. Mallicoat, Dept. of Commerce, State of Oregon, Div. of Planning & Development, Portland, Ore.

Sept. 21: International Atomic Energy Agency Meeting, Vienna, Austria.

Sept. 22–23: Government-Industry Procurement Clinic, Seattle, Wash. Contact: Tom Hynes Jr., Dept. of Commerce & Economic Development, 312 First Ave., N., Seattle, Wash.

Sept. 24–Oct. 2: Greater Jackson Chamber of Commerce Midwest Space Fair, Jackson, Mich.

Sept. 27–30: American Roentgen Ray Society Meeting, San Francisco, Calif.

Sept. 28–29: National Security Industrial Assn. Marine Geodesy Symposium, Columbus, Ohio.

Oct. 3–5: International Electroni Conference and Exhibition, McCormick Place, Chicago, Ill.

Oct. 3–5: Institute of Electrical an Electronics Engineers Aerospa and Electronics Convention, Sheraton-Park Hotel, Washington, D.C.

Oct. 4–6: American Oil Chemists Society Meeting, Philadelphia, Pa.

Oct. 5–7: International Assn. of Electrical League Meeting, Scottsdal Ariz.

Oct. 6: National Security Industri Assn. Annual Meeting and Dinne Washington, D.C.

Oct. 7: Society of American Milita Engineers Meeting, St. Paul, Min

Oct. 9–14: Electrochemical Socie Meeting, Philadelphia, Pa.

Oct. 10–12: Assn. of the U.S. Arn Meeting, Sheraton-Park Hot Washington, D.C.

Oct. 11–13: Armed Forces Manag ment Assn. National Conferen Shoreham Hotel, Washington, D.

Oct. 27–28: Tulsa Chamber of Co merce Air Festival, Riverside A port, Tulsa, Okla.

Oct. 31–Nov. 2: Defense Supply Ass National Convention, Benjam Franklin Hotel, Philadelphia, Pa.

Nov. 8–10: Joint Computer Conf ence, San Francisco, Calif.

Total Package Procurement Concept

by
Col. Robert E. Lee, USAF
Director of Procurement Policy, Headquarters USAF

The purpose of this article is to discuss problems encountered in the C-5A competition, the lessons learned, and changes to be effected by the Air Force in future total package buys. We have had Air Force teams working since the C-5A award on just that subject and we have many changes under consideration. Later in the article, I will discuss some of the more significant lessons learned.

First, I want to clarify just what we are discussing. The Total Package Procurement Concept is an extension of long-standing procurement policy. It can be defined as follows:

> **The procurement of, after a single competition, engineering development and production of systems, and as much support as is feasible such as aerospace ground equipment, spares, training devices and training support, and contractor technical support.**

The key words in this definition are "a single competition." There is nothing new about Total Package Concept (TPC)—the newness is the degree to which it was applied.

Traditionally, we have always had some degree of competition, technical or price, or both, for our major weapon system programs. But for the follow-on production, we have frequently found ourselves in a sole source position, "locked in" with the research and development contractor. When we made our decision to buy the program, much of that decision was based on promises made by the contractor for the performance and cost of the system in production and solely on the R&D effort. Our experience has taught us that these promises tend to be optimistic when a program is being "sold." The total package concept makes these promises contractually binding.

The Air Force Experience.

To date the Total Package Procurement Concept (TPPC) has been applied up to contract award on only one system—the C-5A aircraft.

Other programs have been identified for total package procurement in all of the Services and are in various preliminary stages. Although the C-5A is the first total package procurement, the total package concept is not the only first of this program. The C-5A is the first system to undergo a comprehensive contract definition pursuant to DOD Directive 3200.9 and the first system in which the complete Air Force Systems Command 375 series of program management documents have been applied from the outset.

A Request for Proposal (RFP) containing, among other things, a Work Statement and Model Contract for Contract Definition, and a Work Statement and Model Contract for development and acquisition of the C-5A aircraft, was distributed on Dec. 11, 1964, to the three airframe and two engine contractors who had participated in the parametric studies leading up to the approval of the C-5A program. On Dec. 31, 1964, the Air Force entered into a contract definition contract with each of these five contractors. The work statement called for the identification and preparation of performance specifications to be used in the operational system, as well as price proposals for development, production and support of such hardware.

Support would include all required aeronautical ground equipment, training equipment and contractor technical services, together with spares and maintenance through the Category II Test Period. Spares beyond Category II would be added to the contract by provisioning action and would be priced in accordance with a detailed pricing exhibit in the contract. Award of a contract would be made to the source whose cost and technical proposals as evaluated by the Air Force demonstrated the greatest overall cost effectiveness over a ten-year operating period of the system, complying with all of the minimum performance requirements established in the RFP. To this end the contractor was required to prepare a ten-year operating cost estimate on certain given assumptions. This was to be added to the research, development, test and evaluation (RDT&E) and production costs and compared with the productivity of the proposed system over the same period. Although the initial production airframe buy was only 57 aircraft, a priced option was requested on 58 more. Costs and other factors for source selection purposes was to be computed on a buy of 115 Total Operational Systems.

The technical proposals were submitted on April 20, 1965, and the cost proposals on April 27, 1965.

From a procurement point of view, our major problems were to devise and negotiate a definitive contract that would fix responsibility for the aforementioned premises. How did we do it?

In the contract, in addition to all the normal provisions, there are specific clauses imposing responsibility for the total C-5A on the airframe contractor. The really significant provisions are designed to hold the winner to the commitments on which selection was based. In the air vehicle contract, and most significant of these special provisions, are:

- **Pricing.** The contract has firm target prices for 115 aircraft and the development necessary to produce them. In addition, all aerospace ground equipment (AGE), training and training equipment, contractor support, and spares through Category II testing are firm priced. The incentive cost sharing arrangement has a firm 50/50 sharing below target cost and a 70/30 sharing above target cost to a ceiling price that is 130 percent of target cost.
- **Performance.** The performance commitments established in competition are backed up by a correction of deficiencies clause under which the contractor must, if so directed by the Air Force, correct any deficiency at no change in target or ceiling price. The performance requirements stated in the contract are those proposed by the contractor which must equal or exceed the RFP requirements.
- **Performance Incentive.** Since the correction of deficiencies provisions cover any case of performance less than that promised, there is no negative incentive. There is a reward incentive based on achievement against

a productivity index set forth in the contract. The productivity index is based on payload, range and cruise speed. A 15 percent improvement against the productivity index target will provide a maximum reward of $22.5 million.

• Specification Changes. On individual changes up to $100,000, there will be no adjustment in the target cost. On changes over $100,000 there will be a target price and ceiling price adjustment, including a profit not to exceed 10 percent until all such changes aggregate three percent of the initial total target cost. Thereafter the profit increment cannot exceed two percent. The intent of these provisions is to discourage the contractor from proposing unnecessary changes. However, on individual changes exceeding one percent of the initial target cost, this two percent profit limitation will not apply, because such a change would represent a significant departure from the initial work statement.

• Delivery Incentive. The contract provides a penalty of $12,000 per day late for each of the first 16 aircraft delivered up to a maximum penalty of $11 million. This is a liquidated damages clause.

• Schedule Change. There is a formula for changing the end-item prices if the delivery schedule is compressed or stretched out. This is an example of clauses designed to preclude any negotiation in a sole source environment.

furnished, it was necessary for the airframe manufacturer to negotiate an agreement with the engine manufacturer under which the responsibilities of the manufacturers to each other are specified. Thus, the Air Force, although buying the engines direct and furnishing them to the airframe contractor, can look to the airframe contractor if the airframe/engine combination does not meet its performance "in the air."

Each of the five contractors' proposals was submitted in 30 copies and the total mass of data received weighed 35 tons. Over 400 people spent two and one-half months for a total of 132,000 manhours in reading and evaluating these proposals. Definitive Fixed Price Incentive (FPI) contracts for RDT&E, delivery of 57 total systems, and support as outlined above were negotiated and signed by each of the contractors prior to the source selection announcement on Sept. 30, 1965, a total of 10 months from Contract Definition Phase (CDP) to a definitive production contract on a major Air Force system.

That's enough on what we bought and how we bought it. Let's look briefly at some of the significant lessons learned.

First, it appears that we should adopt the TPC earlier in the cycle than we did on the C-5. The short time that was allotted to get out an RFP caused many problems and changes, which contributed to the massive data we received. Procurement planning must be formalized in the conceptual state of the CDP.

We believe that the detailed submi sions in the areas of AGE and spar were not practicable and we are co sidering changing this approach. W ended up with a formula methodolog for pricing some spare parts and price list for pricing those acquire after the completion of Category testing.

Also, we now believe that we ca reduce much of the management a procurement information that was r quired, through the establishment a data matrix to select what data necessary for each phase. We achiev outstanding success in the use of th model contract technique and as a r sult of our C-5 experience will pro ably use this technique on all co petitive CDP's. This technique, requi ing the preparation of model contrac during CDP, is set up for the purpo of getting all of the boiler plate, sp cial provisions, and other knotty pro lems including legal coordinati resolved prior to actual contract selection.

Some people are firmly convinc that the most important achieveme of TPC was obtaining a complete definitized document under a compe tive umbrella. This could not ha been done had we not fully exploit the model contract during CDP. W are firmly convinced that the increa in data requirements that will ul mately result from CDP and the TI will be well worth this particular e result.

We did run into some problems our cost effectiveness approach, p marily because we didn't establish c ost effectiveness criteria ea nough. We are concentrating mu ffort in this area, particularly as elates to 10-year maintenance a

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DOD Instruction 3200.8, "Standards for Documentation of Technical Reports under the DOD Scientific and Technical Information Program," March 7, 1966. Supplements DOD Instruction 5129.43, dated Jan. 22, 1963. Its primary purpose is to simplify and improve document control and cataloging procedures for technical reports derived from research and development activities of DOD.

DOD Directive 5210.50, "Investigation of and Disciplinary Action Connected with Unauthorized Disclosure of Classified Defense Information," April 29, 1966. Assigns responsibility and the authority to establish policy for investigating unauthorized disclosures of classified defense information and for insuring prompt corrective action, including appropriate discipline of personnel for such disclosures.

DOD Directive 3020.2, "Policy for Protection of Petroleum Installations and Related Facilities," May 4, 1966. Sets forth DOD policy pertaining to the protection against sabotage and enemy action of existing and planned DOD petroleum installations and related facilities, including commercially furnished storage facilities. Additional policy guidance is given with respect to the acquisition of commercial storage facilities on a long-term basis as authorized under Section 2388 of Title 10, U. S. Code. Uniform criteria are provided for the accomplishment of protective construction measures.

DOD Instruction 7041.2, "Cost Information Report (CIR)," June 13, 1966. Provides guidance for the implementation of DOD Directive 7041.1, "Cost and Economic Information System," dated July 7, 1964, including an identification of the families of weapon/support systems affected and the CIR data required.

DOD Directive 3020.32, "Department of Defense Policy for the Development and Utilization of Fallout Shelters," June 20, 1966. Provides uniform guidance on objectives, policies and criteria for determining the nature of fallout shelter requirements, and for developing a plan for fallout shelter programs at all DOD installations in implementation of Section 608 of Public Law 89-188, dated Sept. 16, 1965.

> DOD directives and instructions may be obtained from:
> Publications Distribution Branch
> Office of the Secretary of Defense
> Room 3B 200, The Pentagon
> Washington, D. C. 20301

Defense Procurement Circular No. 42, May 27, 1966. (1) Service Contracts—Notice of Intention. (2) Revised List of Educational or Non-Profit Institutions with Approved Patent Policies. (3) Small Business Size Standards for Fluid Milk. (4) Equal Employment Opportunity.

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> Each Defense Procurement Circular is designed to place new or changed policy or procedures in effect prior to publication of an Armed Services Procurement Regulation (ASPR) revision. ASPR subscribers will receive DPC's and ASPR revisions through the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

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> Publications that require remittance are available for purchase from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

Remote Computing

(Continued from Page 9)

with several small and medium business/logistics programs. The latter would be entered both from slow speed terminals and from high speed terminals sometimes located at remote ADP sites. This would be the start of the Business/Logistics ADPS Service Center.

It was originally felt that it would take a period of five years to accomplish the five phases of the project. However, with the interest and activity demonstrated to date, the ADPS Service Centers should be operational in three years or less.

Remote computing will eventually close the gap that now exists between the use of a slide rule and the extremely complex task of preparing and programming a computer run, delivering it to the data processing center and waiting perhaps hours for a solution. The remote computing concept is almost like having a computer of your own—as far away as your finger tips—continuously "at your service" regardless of your physical location. You can be within reach or you could be at a distance of some hundreds of miles.

Whatever your position might be in today's progressive data processing environment, remote computing is the ascending technique—the status symbol for the individual or activity getting ahead.

The Air Force Eastern Test Range: Government-Private Industry Teamwork in Practice

by

Maj. Gen. Vincent G. Huston, USAF
Commander, Air Force Eastern Test Range
Air Force Systems Command

The Air Force Eastern Test Range (AFETR) is—in terms of work force, geography, investment and activity—the largest of six Defense Department National Range sites. The other five are the Air Force's Western Test Range and Satellite Control Facility; the Army's White Sands Missile Range and Kwajalein Test Site; and the Navy's Pacific Missile Range. Through its Cape Kennedy operations, AFETR has become a world-renowned news dateline, the spawning ground for most of the nation's missile and space progress, and the logical threshold for many of tomorrow's more ambitious objectives.

In the fantastic growth and events of AFETR's 15-year history, one other vital aspect of Cape Kennedy operations has been overshadowed. This is the experience-tempered teamwork that has developed between Government and private industry. The efforts of Federal and commercial organizations located through the United States meet at Cape Kennedy. From this focal point these efforts are diffused into practical uses ranging from space exploration to combat readiness with military units in the field.

Some 30 military and other Federal agencies are permanently represented at AFETR, which is a component of the Air Force Systems Command's National Range Division. These and the more than three score organizations of the aerospace industrial community total a work force now in ex- ---- of 27,000 people. This total does ... short-term contractors ... ment ... per- ... ero-

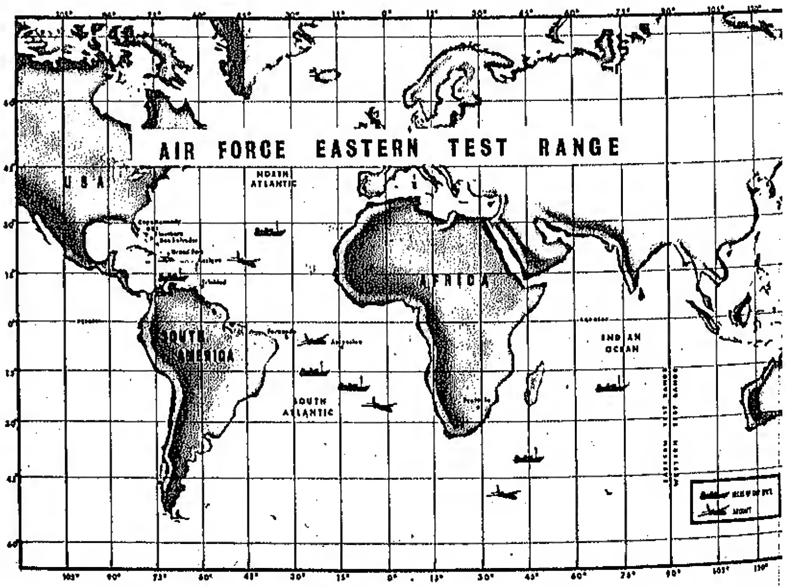
accomplishments of AFETR.

The Eastern Test Range work force consists of 18,900 military, Federal civilians and contractor people. At the center of this functional structure, called simply "the Range," are 4,200 military and Government civilians organically assigned to the AFETR. In addition, there are 14,700 other military and civilian Government personnel and contractor employees engaged in services needed to operate and maintain the range. A major segment of this latter group, which is under the operational control of the range commander, is employed by Pan American World Airways and the Radio Corporation of America.

On the other side of the equation at the Eastern Test Range are 8,400 people assigned to Government organizations and contractors employed in development and testing of missiles, spacecraft and associated subsystems. This segment of activity at ETR is called "Range Users" and is engaged in assembly, checkout, launch, or other phases of vehicle experimentation and evaluation. In addition, the Eastern Test Range serves as ho[s] to over 50,000 official visitors an[d] transients each year.

The range is a high-precision, hig[h] capacity flight test facility for a[ll] larger classes of missile and spac[e]craft research and development. Th[e] primary product of the range is diag[]nostic data. These data are measur[ed] by every available means and r[e]corded in large quantities in real-tim[e] to a nine-digit accuracy. Many oth[er] services are required as a corollar[y] to these data products. They inclu[de] the assurance of range and fligh[t] safety, communications, launch ser[v]ices, the manufacture of liqu[id] oxygen, and ocean search and r[e]covery. These services are in dire[ct] support of stated range-user need[s]. The range must also perform sel[f] support services ranging from t[he] sophisticated (optical calibration, f[or] example) to the commonplace (ba[se] logistic support).

The establishment of AFETR f[a]cilities and services conforms to t[he] fundamental pattern set out in 19[] by the Congress in creating the rang[e]



Specifically, it was the intent of Congress that those test facilities or services needed by two or more agencies, or their contractors, should be provided from a common resource base. This was because, by so doing, more effective operation of hardware having higher standards and greater compatibility could be achieved over a longer period at greater economy. In 15 years, this thesis has been repeatedly proven.

Physically, the range stretches for more than 10,000 miles southeastward from Cape Kennedy to 90 degrees east longitude in the Indian Ocean. In effect, the range is a network of scattered segments. These segments include two major mainland sites at Cape Kennedy and Patrick AFB, Fla., connected by underwater cable to four of seven large off-shore instrumentation stations. There are also 28 associated smaller sites located on the eastern coast of the United States; in the Bahama Islands and Africa; and in Caribbean, South Atlantic and Indian Ocean waters. The range also has a fleet of 16 instrumentation and other support vessels, and a fleet of test support aircraft. Collectively, these assets represent a capital investment in excess of $1.5 billion, which qualifies AFETR as the largest test establishment in the world.

Cape Kennedy, officially Cape Kennedy Air Force Station, is a combination launch site, control center and instrumentation complex. DOD and NASA test organizations, together with their contractors, work in assigned operating facilities in the Cape's industrial area. Elsewhere on the 25-square-mile reservation are all the other facilities essential to test support: 19 active launch areas, propellant storage, special shops and laboratories, fire and rescue centers, a deep water port and a 10,000-foot long landing strip for the air delivery of launch vehicles. With the advent of manned space flight, additional special facilities have been added, including a Bioastronautic Operational Support Unit (BOSU) in support of a launch-site man-recovery system.

A twofold comparison demonstrates the magnitude of the Cape Kennedy operation. The Cape's security guard activity is about as large as the uniformed police force of a city the size of Tampa, Fla. The electrical power consumed at the Cape could also meet the daily requirements of a city that size.

Patrick AFB, located 15 miles south of the Cape, is the headquarters site for AFETR and the general staging center for support of range operations. All AFETR and resident Aerospace Rescue and Recovery Service, Air Defense Command, Military Airlift Command and transient aircraft are based and maintained there. A huge technical laboratory houses the primary data reduction equipment and the largest single photo development facility east of Hollywood. Patrick also serves as the supply and maintenance depot for AFETR activities. The base has a work force of over 9,000, in addition to a military dependent population of about 4,000.

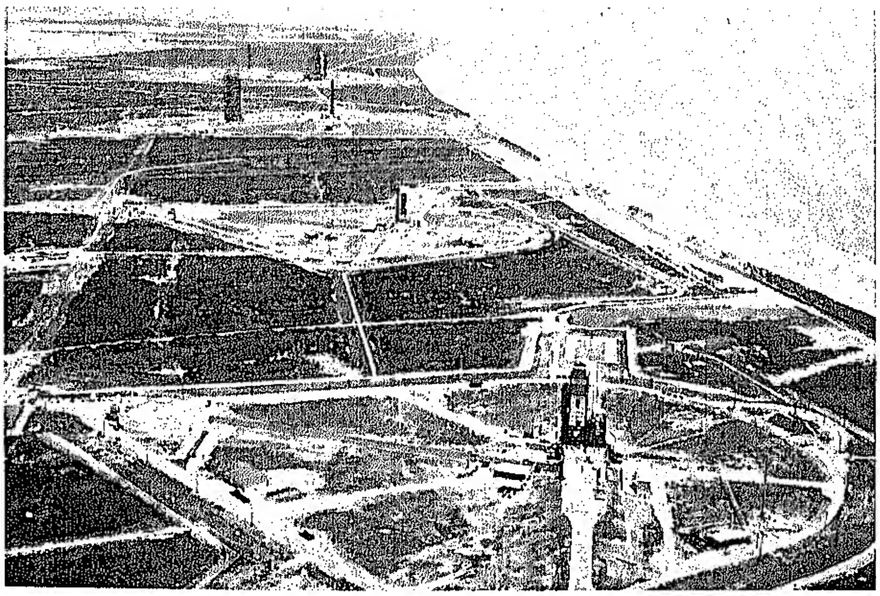
The major AFETR downrange stations all perform similar data acquisition functions, differing in size only because of variations in their instrumentation. The stations are located on the islands of Grand Bahama, Eleuthera, Grand Turk, Antigua, Trinidad and Ascension, and at Pretoria in South Africa. The range also provides communications and logistic support of the Air Force Satellite Control Facility station at Mahe in the Indian Ocean.

AFETR's ocean-going fleet now totals 16, ranging from 17,000-ton Advanced Range Instrumentation Ships (ARIS), used for complex missile reentry tracking, to medium-sized telemetry ships and smaller inter-island support craft. Although the range's vessels are deployed throughout the world, their primary zones of operation are the Atlantic and Indian Oceans. Marine support bases for the ships are operated by the range at Port Canaveral, adjacent to the cape; Trinidad; Recife, Brazil; and Port Louis, on the Indian Ocean Island of Mauritius.

The range has three basic types of test support aircraft designed for general purpose instrumentation missions. There are 11 JC–130 turboprop aircraft for long-range, direct-telemetry reception or pickup from ships, and for ocean search and recovery. Five medium-range, propeller-driven C–131's perform radio interference and general surveillance tasks. Nine JC–135 jets for high-speed, long-range telemetry missions are currently being phased in. Some of these jet aircraft will also be equipped with Airborne Lightweight Optical Tracking Systems (ALOTS), now undergoing final engineering evaluation on the range.

Technological progress at AFETR went through a number of development stages. Initially, the range was oriented almost exclusively to cruise (aerodynamic) missiles, such as the Martin Matador, Northrop Snark and

(*Continued on Page 19*)



ICBM Row, Air Force Eastern Test Range.

FROM THE SPEAKERS ROSTRUM

Excerpt from address by Maj. Gen. J. W. O'Neill, USAF, Commander, Electronic Systems Div., Air Force Systems Command, at the National Telemetering Conference, Boston, Mass., May 12, 1966.

Maj. Gen. J. W. O'Neill, USAF

Thank you for this opportunity to discuss the Air Force Systems Command's Electronic Systems Division's role in telemetry. . . .

You may be aware that the National Telemetering Conference (NTC) was one of the first conferences on space communications and telemetry. During the past 17 years it has continued to grow in stature under the joint sponsorship of the American Institute of Aeronautics and Astronautics (AIAA), the Institute of Electrical and Electronic Engineers (IEEE), and the Instrument Society of America (ISA). . . .

To my mind it is logical and most proper for the AIAA, IEEE and ISA to sponsor the NTC because the industries they represent basically depend upon advanced remote control and telemeter tools to achieve progress in their respective fields.

Now let me get to a part of my story that is closer to home and tell you how the Electronic Systems Division (ESD) got involved. You will recall that the space business is not very old. It started with ballistic missile development in the mid-1950's and very rapidly, thereafter, there came into being some rather extensive ranges such as Cape Canaveral in Florida and Point Arguello in California. At each of these ranges, space/ground instrumentation systems and elements of world tracking nets were developed, each of which was installed at the behest of individual space projects. With the spectacular growth of these range head stations and their nets, it soon became apparent that some overall management would have to be applied to them so that across-the-board master planning could be accomplished and economics made in the total future instrumentation configuration.

The problem was somewhat akin to the early period of aviation when each airline installed its own radio ranges. This got to be so expensive that the airlines were glad to pass the problem and the costs to antecedants of the current Federal Aviation Agency (FAA). Out of the burgeoning growth of the space ranges came the concept of the National Range Division (NRD) which would perform global range planning and play a heavy role in standardization of space range instrumentation.

With the Air Force Systems Command (AFSC) acting as the DOD executive agent for NRD, it soon became apparent that a central agency was needed that would be responsible for development of range instrumentation in response to NRD planning.

AFSC recognized that range instrumentation development would eventually interface quite sharply with ESD efforts on global communications and world-wide space surveillance and tracking efforts. It therefore placed the responsibility for future development at ESD. The thinking was that range instrumentation systems are specialized, ground-based command and control systems within the area expertise of ESD. In a broad sens the aeronautics and astronautics el ments of the command decided t electronics specialists of System Co mand should take over this functi and that we did. Having this respo sibility is not without its problem so some portion of my time is d voted to systems development pr lems directly relating to the el tronics being installed in ran stations, space vehicles and on a vanced global range aircraft. Ple believe me, it makes for some v interesting system management pr lems.

Our job of supporting Air Fo test ranges involves many tasks. discuss a few to help you apprec the scope of our work. Some of recent efforts have included the:

- **Apollo Range Instrumental Aircraft (A/RIA)** developed in s port of the National Aeronautics Space Administration (NASA). of the chief functions of this airc will be the reception and recordin information telemetered from Apollo Command Module.

- **JC–130 Instrumentation Prog** in support of the AFSC S Systems Division. The program i tended to enhance the aerial covery capabilities of JC–130 airc through the development of a te etry receive, record and data dis capability for them.

- **Re-Entry Systems Evalu Radar (RESER)** being develope use by NRD, to be used in eva ing ballistic reentry systems in Pacific.

- **Coherent Signal Processor** developed jointly by NASA/ This is a doppler system for ap tion to range radars to facilitate cise velocity measurements.

- **Digital Range Safety/Com Systems** being developed for the

ranges for use in carrying out the command destruct function necessary when launching R&D boosters, and for other command functions.

Turning specifically to telemetry, I'll review some of the important things we are doing or trying to do. I've already mentioned that we are doing development work for ranges but, over and above this, I think we are concerned with two major efforts. One of these is standardization of telemetry systems; the other is the transition of AFSC telemetry services from VHF to UHF.

First, let's consider standardization. Several groups have tackled this problem of standardizing telemetry systems.

In 1960 this NTC group formed a Telemetering Standards Coordination Committee (TSCC), covering all types of telemetry applications, to serve as a focal point to receive, coordinate and disseminate information, and to recommend and endorse standards, methods and procedures to users, manufacturers and supporting agencies.

On the military side, in 1952, the range commanders of the Atlantic Missile Range, Pacific Missile Range and White Sands Missile Range established the Inter-Range Instrumentation Group (IRIG) for the interchange of information between the ranges on common problems concerning instrumentation. Since the early 1950's, IRIG has been issuing standards, one of which is aimed primarily at the range telemetery systems.

IRIG's efforts undoubtedly prevented utter chaos in the past. However, though standards were continually updated, they tended to lag behind actual practice to some extent. Further, many range users continued to develop unique systems for special applications. These conditions led Dr. Harold Brown, now Secretary of the Air Force, to state in 1962 that inadequate investigation of agency requirements had resulted in non-standard systems. He requested the Assistant Secretaries of the Army, Navy and Air Force to insure maximum adherence to IRIG 1–6–60 standards. Additionally, non-standard telemetery systems were not to be placed on ranges without the approval of the range commanders. Dr. Brown's memorandum recognized that standards cannot be written to cover every conceivable requirement, and that telemetry systems for some programs may have to be tailor-made on a one-time basis. But, it also called for project offices to review and approve such systems that involve ground equipment.

The Assistant Secretary of the Air Force (R&D) responded to Dr. Brown's request by asking AFSC ". . . to initiate an exercise to list all the prime systems, to give the important technical characteristics of the different telemetry systems, and to provide a plan for (a) reducing the number of telemetry systems from the point of view of their compatibility, and for (b) reduction of development costs and of prime contractor engineering efforts." The task was assigned to ESD with technical support from the MITRE Corp.

ESD conducted the study and made recommendations that we think are a starter in getting an effective telemetry standardization program under way. Presently, we are conducting a review of all Systems Command Instrumentation Development Plans; providing engineering assistance to Systems Command divisions and centers; providing technical assistance to System Program Offices for instrumentation compatibility with the ranges; and conducting an independent review of telemetry requirements placed on the ranges.

Looking to the future, we think there is a need for establishing standard telemetry test procedures. This would involve environmental testing and systems testing as well as component testing.

Now, I'll turn to our second major telemetry effort: the transition of telemetry operations from VHF to UHF.

As background I think I should briefly state the two reasons for the transition. One is the interference resulting from mutual use of VHF by the ranges and by the military tactical organizations. The other reason is that the requirements for wideband telemetry necessitated movement to an area of the spectrum where they could be accommodated. In February 1965 the Military Communications-Electronics Board directed the Military Services to shift telemetry activities from VHF to UHF by Jan. 1, 1970.

ESD has been given overall AFSC responsibility for the coordination of this shift. We at ESD consider this coordination to be our most significant role in future telemetry development. This will involve planning the shift, coordinating range procurements, developing new UHF equipment, and establishing a meaningful test program.

How does this transition affect the telemetry industry? Although an exact amount is difficult to obtain, we estimate that DOD, to date, has invested about $40 million since initial efforts at implementing a UHF capability began several years ago. This amount includes equipment development and procurement costs. At the present time, for example, DOD is funding over 70 individual component development efforts in UHF transmitters, receivers and antennas. Further, we have extensive equipment purchases each fiscal year. It is estimated that future costs will total about $70 million distributed over the next several years.

So much for UHF transition. Let me conclude with a few observations on what I see as future trends in telemetry.

First, it seems clear that the number and complexity of spacecraft will increase, along with increased mission durations and transmission distances. This will demand exceptional stability and reliability characteristics in instrumentation, both in the vehicle and on the ground—to say nothing of the requirements for handling greater amounts of data.

Computers will be required during the coming decade for increasingly greater roles in telemetry operations. Several automated telemetry stations are already operational. Some of the advantages are shorter set-up and calibration time, and faster data reduction and presentation.

The greatly increased transmission distance will tend to make lasers more attractive for telemetry applications.

Microminiaturization techniques will be essential in space vehicle telemetry systems and widely employed in ground-based systems as well.

Finally, I think unified systems, in which one system performs the functions of tracking telemetry and command, will predominate on the ranges in the future.

(*Continued from Page 15*)

Boeing Bomarc. These early missiles were followed by the North American Navaho, Fairchild Bull Goose and Martin Mace. Most of these programs were tested in the 1950's.

In response to recommendations in he von Neumann Report (an analysis f Air Force missile technology), inercontinental ballistic missile (ICBM) levelopment was accorded the highest ational priority in 1954. As a reult, AFETR underwent a period of adical, urgent redesign and augmenation. The range emphasis changed rom long duration, cruise missile overage to a much more accurate rajectory measurement capacity.

There followed in quick succession n entirely new category of weapon ystems—the Douglas Thor, Convair/ ieneral Dynamics Atlas, Chrysler upiter, Martin Titan and Lockheed 'olaris. These were the first generaion ballistic missiles that laid the roundwork for more advanced missiles, such as Boeing Minuteman and mproved models of Titan and Poaris, and future space efforts.

Several factors stand out in the ourse of AFETR's growth to keep ace with the exploding technology hat has characterized large-scale esting in the last decade. There has een constant pressure for improved nstrumentation accuracy, coverage nd capacity. High-speed computers or handling complex mass equations re mandatory. Sophisticated communications equipment is now comnonplace.

Data acquisition systems advanced rom modified World War II radars o long-range, pinpoint-accurate quipment. In fact, keen competition nsued between the men who develped the rockets and those who made round support elements. For example, n the late 1950's General Electric's Iod III missile guidance system howed an order of accuracy beyond nything available to measure it. This d the company's tracking equipment ngineers to come up with the Preision Missile Trajectory Measureient (MISTRAM) system.

Elsewhere in the search for new ange equipment, General Dynamics eveloped the AZUSA and GLOTRAC ontinuous wave tracking system. The adio Corporation of America proluced the Missile Precision Instrumentation Radar (MIPR) family of fixed and transportable radars capable of locating space objects within .05 miles in azimuth/elevation and to within 50 feet in range. Several new, large telemetry dish antennas appearing on the range are prototypes in their class. Radiation, Inc. is a pioneer contributor to such developments. The new Telemetry Central (TEL IV) tracking system, now being completed on the range, incorporates the efforts of Defense Electronics, Monitor Systems, Telemetrics Beckman Systems, Electro-Mechanical Research and General Dynamics. At downrange stations, Space General has provided many of the recently installed telemetry receivers.

To meet the surge in ballistic missile testing and the need for high resolution, long-range optical tracking devices, Parkin Elmer and J. W. Fecker developed the Recording Optical Tracking Instrument (ROTI) and Intercept Ground Optical Recorder (IGOR), respectively. Under ideal operating conditions, these instruments can photograph an object the size of a baseball 100 miles away. To use a more graphic illustration, under the same conditions either instrument would permit an umpire in Philadelphia to call balls and strikes in New York City's Yankee Stadium.

From its earliest days, AFETR has had an intense and continuing requirement for a high performance data reduction capability. This requirement was met only after the development of advanced data processing equipment by such industrial concerns as International Business Machines and Control Data Corp.

The development of spacecraft followed naturally and closely on the heels of the accelerated ballistic missile programs. In October 1957, the launch of the Soviet Union's Sputnik I rudely shook the nations technological complacency. The U.S. satellite effort was still in the assembly and checkout stages at Cape Kennedy. The first successful American satellite did not go into orbit until January 1958.

From this somewhat inglorious beginning have evolved the increasingly successful and sophisticated achievements that have become synonymous with Cape Kennedy. Pioneer, Explorer, Ranger and Mariner became famous spacecraft names. In launch vehicles, the names were Thor-Delta, Atlas-Agena, Atlas-Centaur, Saturn and Titan, to name a few.

The nation's manned space flights got under way in 1961 with the Redstone-Mercury launches. Manned Atlas-Mercury and Titan-Gemini launches followed. These are to be followed by the Saturn I-Apollo earth orbital and Saturn V-Apollo lunar exploration flights.

It is not always evident that the success of Cape Kennedy's missile and space missions depends on intricate, highly integrated ground support. This is the role AFETR is currently most heavily engaged in. This role will become even more pronounced in the future.

In the uncertain art of forecasting, several facts and considerations bearing upon AFETR's future stand out. Eastward launches assure the greatest payload-to-booster thrust ratios and orbital coverage of the most heavily populated latitudes of the the earth's surface. Cape Kennedy is ideally situated (within six degrees of the ecliptic plane) for lunar/interplanetary launches. The cape is the nation's most conveniently located launch site for equatorial or synchronous orbits.

In this context, the Air Force Eastern Test Range's greatest legacy to the nation's space objectives is probably in the area of things as yet uninvented and places as yet unexplored. Whatever the future, much of the foundation, tradition and existing national talent in the realm of "range art" had its beginning at Cape Kennedy.

Aeronautical Planning Seminar Proceedings Available

Copies of the proceedings of the Air Force-Industry Planning Seminar on Aeronautical Systems, held at Wright-Patterson AFB, Ohio, March 23-25, 1965, are now available to interested industrial organizations.

Because the document is classified Secret, the proceedings will be available only to industrial concerns with proper security clearance and need-to-know.

Request should be forwarded through the appropriate Defense Contract Administration Services Region to the Defense Documentation Center, Cameron Station, Alexandria, Va. 22314. The document is identified by DDC No. 373116.

Total Package Procurement Concept

(Continued from Page 12)

deficiencies, ensures that we will not be looking over your shoulder and "helping you" engineer and produce as much as we have in the past. But the nature and degree of disengagement still requires case-by-case determination and we intend periodically to review progress in this regard on the C–5.

A few quick words on the Systems Project Office (SPO) manning. Since the C–5 TPC competition, there has been considerable discussion on this subject. We in the Air Force are impressed with the need for comprehensive manning of our program offices at the outset of the program—before we write the RFP. Adequate manning is an urgent requirement under today's environment—where the RFP, CDP and the contract fix the parameters of the program in considerable detail. The SPO can no longer "grow with the program." There is good reason to believe that the maximum number of people are needed at the outset—with some tapering off downstream. A major review of our SPO manning precepts is indicated.

Finally—what is the future of the TPC?

The already demonstrated benefits of applying TPPC to the C–5A program have been enough to engender considerable interest in the concept. Identification of and preparation for total package contracting in the Air Force Short Range Attack Missile (SRAM) and the Navy Fast Deployment Logistics (FDL) programs attest to this fact. The Director of Defense Research and Engineering has asked the Air Force for a comprehensive analysis of its C–5A procurement experience to be distributed through his office to all secretarial levels in the Office of the Secretary of Defense. The Assistant Secretary of Defense (Installations and Logistics) has asked the Air Force [illegible] mentation through the Armed Services Procurement Regulation.

How wide an application the concept will have within DOD is a function of many variables, some of which pertain to the basic requirements of our defense posture and its relationship to conditions in a constantly changing world. Other variables depend primarily on the selection techniques used to identify those systems that should be acquired to fulfill those requirements. Within these constraints, the extent to which the concept might be applied is a function of the benefits to be achieved weighed against the disadvantages to be endured on the basis of a case-by-case analysis of the procurement involved. In view of TPC's overwhelming success to date in the C–5A program, maximum efforts are rightfully being made to eliminate, insofar as is possible, the problems that I have discussed here and many, many more.

In summary, a review of our experience with TPC thus far reveals that:

- Data has increased substantially due to CDP, TPC and Air Force Systems Command Manual (AFSCM) 375–5.
- The multiplicity of new concepts, changes and clarifications created major problems in competitive environment.
- The extent of detail data submittal was excessive due to newness of concept and over-reaction of contractors.
- Some redundancy in data submittals has occurred.
- Systems engineering (AFSCM 375–5) is conceptually compatible with TPC but requires considerable refinement.
- Configuration management (AF SCM 375–1) is compatible with TPC with minor refinement.
- Data management (AFSCM 310–1) is compatible with TPC. However, much more discipline is needed.
- Source selection process can be simplified. Some progress has been made, but much more is considered possible.
- The basic purpose of the TPC was achieved in the C–5A.
- The TPC contracting technique will continue to be studied with the objective of deriving more benefits. The success of this will largely depend upon the diligence and the vision of both industry and the Air Force in applying this concept to future programs.

Price Increase for Quinine and Quinidine Subject of Senate Hearing

The price increase for quinine and quinidine was the subject of hearings conducted on May 18, 1966, by the Senate Antitrust and Monopoly Subcommittee of the Committee of the Judiciary. Shirley C. Fisk, M. D., Deputy Assistant Secretary of Defense for Health and Medical, was the principal witness for the Defense Department.

The purpose of the hearings was to ascertain the cause of the price increase which, for both drugs, was eight to tenfold. Since the source of both quinine and quinidine is controlled primarily by European processors, the subcommittee investigated the possibility of collusion or price fixing following announcement by DOD of significant requirements for quinine in 1964.

Detailed information was provided to the subcommittee by DOD on requirements and methods followed in attempting to purchase the drugs and the principal suppliers in the United States. Testimony was given on DOD knowledge of the market and supply.

At the conclusion of the hearings, the subcommittee requested the Department of Justice to investigate the possibility of price fixing by European firms in providing quinine and quinidine to importers in this country.

Total DOD requirements for quinine have been obtained by release from the National Stockpile. No quinine has been purchased from commercial sources for several years. Some of DOD requirements for quinidine have been provided from stockpile quinine in order to relieve pressure on the civilian market. This method of procurement will be continued until the supply and price situation becomes stabilized. The stockpile assets are adequate to meet DOD demands for the foreseeable future.

Control Pages of Classified Documents

A frequently posed question by recipients of classified documents is: "How should accountability be established for individual pages extracted from formal documents?" This problem develops whenever a classified document is "cannibalized" and pages from it are used in the preparation of another classified document.

A recommended procedure is to establish a subcontrol station to maintain individual pages and accounting records as well as a listing of the pages and descriptive data. To maintain control, use a charge-out card system which provides space for indicating the ultimate disposition of each page.

(*Continued from Page 3*)

and development effort, the Correspondence School is ever alert to opportunities to add to the freshness and vigor of student instruction. In 1963, responding to the heightened emphasis on management in the Resident Course, the Textbook Development Group produced a new foundation text, "Management: Concepts and Practice." The group contributed to the development of a Resident School anthology on counterinsurgency and, in turn, adapted it to correspondence instruction by publication of a text titled "New Dimensions in the Cold War: Transition and Tension in the Underdeveloped World."

Similarly, paralleling the current emphasis on scientific decision making in the resident curriculum, the Correspondence School will soon publish a text on "The Department of Defense Planning-Programming-Budgeting System." This text embodies the thinking of the three principal architects of the contemporary approach to decision making: Secretary of Defense Robert S. McNamara; Charles J. Hitch, former Assistant Secretary of Defense (Comptroller); and Dr. Alain C. Enthoven, Assistant Secretary of Defense (Systems Analysis). The student will thus gain a deeper insight into Mr. McNamara's quest for options and his emphasis on analyses of cost and effectiveness in deciding on the best allocation of resources for Defense programs.

The so-called "systems analysis" approach in the Pentagon, it will be made clear, strikes deep in the past; it represents extension of techniques of economic analysis long used in industry and of the systematic discipline employed in military operations research since World War II. The student will find in this text not a detailed account of techniques and methodologies, but an elucidation of the broader aspects of this emerging discipline—its essential characteristics, its applications, its strengths and, indeed, its limitations in top-level decision making. Computers and operations research techniques, the student will learn, can never replace value judgments, but they can help to provide the factual and analytical basis for informed and reflective judgment. A study of this text will bring out what is at the heart of Mr. McNamara's approach—his insistence on the application of greater objectivity, logic and explicit analysis of the issues and alternatives in considering the best Defense policy to attain national security objectives.

Forward Planning.

By mid-1965, the Correspondence School had reached a full cycle of textbook development and revision. Though its texts were then on a solid footing, the school embarked on a new program marking a substantial adjustment of its curriculum to reflect a number of changes fundamental in the Resident Course. The changeover, scheduled over a three-year period, will see the phaseout and replacement of 10 of the 22 texts currently in use. It poses a formidable challenge in developing the new texts as well as in realigning, adapting and updating existing texts.

As fully developed by mid-1968, the new National Security Management course will closely parallel the current structure and content of the Resident Course. Along with a tightening and updating of existing texts, several gap-areas will be filled. Science and technology, for example, will be treated as a basic national resource, and Defense research and development will receive separate and comprehensive coverage. A full text will be devoted to Defense organization and management, highlighting the road to unification, the progressive centralization of authority in the Secretary of Defense, the strengthening of the Joint Chiefs of Staff, and the creating of other agencies and instruments to support and assist the Secretary in managing the many varied and far-flung activities of the Defense Establishment. As indicated, one such instrument, the Department of Defense Planning-Programming-Budgeting System, will be given special emphasis in another full text, as part of the college's continuing effort to enhance the development of military and civilian officials who are better informed and better equipped to meet present and future challenges to our national security.

While seven of the 22 texts in the new series will be devoted specifically to Defense logistics management, due account will be taken of the total "balance sheet" of our national strength and liabilities. The series will continue to stress the interwoven relationships of our managerial, scientific, industrial, economic and social institutions, and the management problems and challenges in marshalling these institutions in support of national policy. Appropriate attention will be given to the planning for peace as well as for war—maintaining high levels of economic growth and stability; effecting the proper distribution of basic goods and services; raising living standards, national health, education and science programs; working with our allies in the pursuit of peace and security; and assisting the emerging nations of the world in their struggle for maturity and independence. At the same time, the student will be impressed with the fact that in today's shrunken world, with no clear lines discernible between peace and war, it is all the more important that our total resources and managerial talent be readily adaptable to changing conditions. He will see how the Government, in concert with industry, labor, the professions and the public, seeks to ensure orderly planning for the prompt and effective redirection of the economy to emergency needs.

An Opportunity for Self-Development.

Our Correspondence Course is not designed to train specialists, but specialists and generalists alike will profit immeasurably from close, disciplined study of the 22 bluebooks comprising the course. These are not broad-brush presentations, and the course is not a "snap." It generally takes 12 to 15 months of diligent application to complete this course. A comprehensive evaluation examination is administered on each unit to measure learning achievement.

Only energetic students can hope to complete the course successfully. Only 50 percent do, and some 71 percent of all graduates hold at least a bachelor's degree. The course is open to select clientele: military officers of all components of the Department of Defense and the Coast Guard serving in active or inactive status in the grade of major or lieutenant commander and above, civilian executives, members of the several professions, Federal employees with ratings of GS-11 and above, and certain military and federally employed nationals of friendly foreign countries.

Reserve officers not on extended active duty may earn a total of 48 credit points for retention and retirement purposes. Satisfactory completion reports on military personnel and Fed-

DIPEC—A Source for Needed Industrial Plant Equipment

e Defense Industrial Plant Equip- Center (DIPEC) at Memphis, ., is a vital source of assistance overnment agencies and defense actors in meeting military com- ients, especially in times of emer- y.

ice its establishment in 1963, C has continued to supply con- ors with vitally needed items of trial plant equipment (IPE) h could not be purchased by in- y in sufficient time or quantities eet production requirements. The nt Southeast Asia buildup is an ple of how this type of help can ed advantageously.

e center was established to ve greater economy through re- ibution of idle equipment. It is onsible for assuring that one component does not procure a item while another component a similar item not being used. ough DIPEC is under mandatory irement to service DOD com- nts, it also provides certain pment by agreement to other rnment agencies, such as the Na- l Aeronautics and Space Admin- tion and the Atomic Energy mission.

t its Memphis headquarters, EC holds either technical or op- ional control over six equipment age and repair/rebuild sites from h equipment is shipped to users. IPEC now maintains records on a l inventory of some 331,000 items equipment valued at about $3.5 on. This inventory encompasses s of metalworking, electrical- tronic, test and general purpose strial plant equipment used in the arch, building, testing and main- ing of weapon systems and other nse materials.

nder a Defense Supply Agency In- rial Equipment Reserve (DSAIER) gram, DIPEC manages an indus- l plant equipment package reserve h consists of machine tools and r items necessary to the produc- of a military end item not im- liately available on the market. se packages are designed for pro- ing items common to the Services, h as landing mats, concertina wire, l helmets and liners, mess gear and kitchen equipment, tents and other basic equipment. Packages presently in reserve are valued in excess of $5 million, with another $8 million worth now being brought into the program as a result of transfer of management responsibility from the Army to the Defense Supply Agency.

Since becoming fully operational, DIPEC has shown its ability to support its customers through efficient reutilization of its assets. It is now screening an average of 3,150 requisitions a month against its idle inventory.

In FY 1965, DIPEC effected reutilization of more than 18,000 items of equipment valued at more than $101 million. Through the first eight months of FY 1966 redistribution of idle equipment amounted to $102 million.

DIPEC's contributions toward the economy and the military effort have been noteworthy. Some examples of savings to the Government are:

- Four 1,000-ton mechanical presses were furnished the Army's Ammunition Procurement and Supply Agency, Joliet, Ill. The acquisition cost of these items totalled more than $500,000.
- Three 1,600-ton mechanical presses for use on the Bomb Demolition M-117 program, with a total acquisition cost of $556,650, were also provided for the Army.
- An impact hammer with an acquisition cost of $165,090 was shipped to the Bell Helicopter Co. in Fort Worth, Tex., for use on the Army's UH-1 helicopter production program.
- A milling machine, which originally cost the government $167,712, was supplied to the Martin-Marietta Co. of Baltimore, Md., for use on an Air Force production program.
- A boring and turning machine, declared idle at the General Electric Co. at Burlington, Vt., was moved to the Philadelphia Naval Shipyard to replace an older machine. Acquisition price of the idle machine was $126,025.

In the midst of these achievements, DIPEC continued the difficult and time-consuming task of developing standards for describing industrial plant equipment. Commonly understood terms permit the cross-servicing of equipment (which hitherto was often blocked by terminology familiar enough to one agency but obscure to another) and provide for a more efficient utilization of electronic data processing.

DIPEC has also been involved in developing a subclassification coding system within the Federal Supply Classification (FSC), known as PEC's, or Plant Equipment Codes. The PEC's not only embody the FSC but identify type, size, capacity and other characteristics of the item.

DIPEC develops, publishes and maintains IPE handbooks that include the production equipment code cross-referenced with nomenclature, the nomenclature cross-referenced to the PEC, item description by manufacturer, and guides for preparing description of IPE.

Publication of all handbooks covering the entire DIPEC scope of 88 FSC's is scheduled for completion by November 1966. These will provide more than 100,000 individual identifications by manufacturer's part/model number and will specifically identify items of in-use and idle IPE to be reported to DIPEC or to be screened by DIPEC prior to procurement.

These will greatly facilitate management of IPE throughout the DOD.

As a part of its responsibility to maintain a balanced reserve of IPE, DIPEC manages the National Industrial Equipment Reserve (NIER) program under Public Law 883. This provides for a national reserve which may be loaned, leased, or transferred to other Government agencies, non-profit educational institutions, or training schools, and may be used by private industry in the event of emergency. In recent years, considerable emphasis has been given to loaning NIER equipment to vocational training schools.

The first loan of NIER equipment to a school was authorized in late 1958 and since that time interest in the program has grown to considerable proportions. Requests have been received from almost every state, including Hawaii. Through Dec. 31, 1965, there were 141 loans to schools and two to Job Corps camps. These loans covered 3,917 items of equipment valued at about $16,374,000.

Approval of these loans does not affect the DOD surplus property pro-

gram under which educational institutions and training schools may acquire surplus tools as they become available.

Some of the more far-reaching benefits expected to accrue from this facet of the NIER program are:

• A reserve of skilled labor of unlimited value in the event of mobilization.

• The retention of a reserve of Government-owned machinery on a dispersed basis.

• A saving to the Government of processing, storage and maintenance costs of the loaned equipment.

Among Federal agencies benefiting from DIPEC's program is the U.S. Treasury Department. A total of 61 items valued at more than $632,000 has been made available to assist in relieving the coin shortage. DOD-owned presses on loan to U.S. Mints provided the additional capacity to increase FY 65 production to eight billion coins. The total FY 64 production was 4.3 billion.

Through an agreement between the Defense Supply Agency and the Federal Aviation Agency (FAA), FAA contractors are obtaining loans of idle DOD industrial plant equipment for use on the Supersonic Transport (SST) Development Program. Although the final SST contract will not be awarded until December 1966, FAA is authorizing two airframe and two engine contractors to screen the DIPEC idle reserve for equipment to aid in improving design and for building full-scale models of the SST.

Defense contractors also are saving dollars for the Government by using idle IPE. A Massachusetts firm needed two grinding machines for use on military engine production programs. DIPEC made the machines available from its Terre Haute, Ind., storage facility.

In another case, a New York company required an all-weather chamber as part of a vibration test facility called for in the manufacturer's contract. DIPEC directed shipment of the chamber, which was in process of being placed in idle storage, thus saving the Government at least $218,530.

A furnace, required by a contractor at Hartford, Conn., had been declared idle and marked by DIPEC for shipment to one of its storage sites. In cooperation with the Bureau of Naval Weapons, DIPEC returned the furnace to active use to increase production of aircraft engines at the Connecticut plant.

In a variety of ways, DIPEC is continuing to aid the nation's defense effort and save the taxpayer's money by its efficient reutilization of equipment. In addition, it is providing the buildup of a reserve of skilled personnel through its loan of equipment to vocational training schools.

Cost Reduction Report

(Continued from Page 5)

Shifting from Cost-Plus-Fixed-Fee (CPFF) to Fixed-Price Contracts. The first ten months of FY 1966 show a continuing decline in the proportion of CPFF type contracts awarded, reaching a rate of 8.9 percent compared with the peak of 38 percent recorded in March 1961.

CPFF contracts, while being the easiest to award are the most difficult to administer, and more important, provide little or no incentive for the contractor to hold costs down or meet performance and delivery specifications. Because they do permit work to get under way rapidly and are particularly suited to highly uncertain situations, we have had to use CPFF contracts in the case of a number of Vietnam-related projects, for example, the construction of U.S. military facilities in that country. Despite these unusual requirements, we were able to show further progress in FY 1966. Since on the average at least ten cents is saved on each dollar shifted from CPFF to some other form of contract, this means an estimated saving of $684 million. Again, the actual results of the last two months may increase the CPFF rate somewhat, but we should still be able to better the goal set for the year.

As the proportion of CPFF contracts has declined, that of firm, fixed-price contracts has risen, and by virtually the same amount. This is especially gratifying inasmuch as under most conditions, the firm, fixed-price contract is preferable, with the contractor assuming full cost responsibility and guaranteeing performance and timely delivery.

Multi-year Procurement. Multi-year competitive contracts enable bidders to offer the Government lower prices since the larger quantities and longer production runs usually result in lower unit costs, as shown below:

FY 1964

Number of Actions	42
Value of Actions	$230 million
Savings	$7 million
Rate of Savings	3.2 percent

FY 1965

Number of Actions	129
Value of Actions	$854 million
Savings	$69 million
Rate of Savings	8.1 percent

FY 1966

Number of Actions	193
Value of Actions	$850 million
Savings	$80 million
Rate of Savings	9.4 percent

SUMMARY

With a record of five years of achievement behind us, there should be no question as to the value of the Defense Department's Cost Reduction Program. Not only has it produced very substantial savings but also it has significantly improved the overall efficiency of our logistics system, as evidenced by its ability to support promptly the sudden increase in workload imposed by the conflict in Vietnam. Six weeks ago Senator Douglas, speaking as Chairman of the Subcommittee on Federal Procurement and Regulation summed up the Committee's annual review of our Cost Reduction Program with the following comment:

". . . cost reductions of several billions of dollars annually have been achieved by adopting, among others, many of the suggestions of this subcommittee. In the process, . . . toes have been trod upon, oxen gored, and hostility encountered which is inevitable.

"Errors may have been committed and certainly much remains to be done in carving more fat and waste . . . but I urge everyone to view our suggestions and recommendations against the background of the scope of the job and the unprecedented accomplishments. We must not undermine . . . the greatly improved structure . . . nor . . . relax our efforts toward further progress."

It is my intention to ensure th there is no relaxation of effort a that further progress is achieved the year ahead.

Competitive Procurement of Ocean Freight Service Announced

The Defense Department has initiated the first step in a new system of competitive bidding from the maritime industry for moving military cargoes on regularly scheduled commercial ships.

On June 16, 1966, the Commander of the Military Sea Transportation Service (MSTS) requested competitive proposals from the maritime industry on shipping rates for the transportation of military cargoes between Atlantic, Gulf and Great Lakes ports of the United States and ports in the United Kingdom and northern Europe. The deadline established for receipt of proposals was July 20. Awards will be made within three weeks of that date. The effective date for shipping military cargoes under the new system for the North Atlantic is August 31.

The Federal Maritime Commission (FMC) held hearings, now completed, on tariffs and rates for military goods moved in ships belonging to shipping conferences and in ships not belonging to such conferences. Mr. Robert C. Moot, Deputy Assistant Secretary of Defense (Logistics Services), in testimony before the FMC on April 4, 1966, stated that DOD planned to institute a system of competitive rate bidding for sealifting military cargoes. Mr. Moot testified that DOD, through the Navy's Military Sea Transportation Service, would no longer purchase shipping space on the basis of prices negotiated through shipping conferences or associations. The latter procedure had been followed by MSTS since 1950.

The Defense Department plans for all trans-oceanic shipping trade routes handling military cargoes to be on a competitive basis within the next nine months. The following is the program for each trade route with the dates that MSTS will issue Requests for Proposals and the effective dates for the new system in each case:

North Atlantic: June 16, 1966
Effective date: Aug. 31, 1966.
Far East: Aug. 1, 1966
Effective date: Sept. 30, 1966.
Mediterranean: Sept. 1, 1966
Effective date: Oct. 31, 1966.
Inter-port trades: Nov. 1, 1966
Effective date: Dec. 30, 1966.
Caribbean: Oct. 1, 1966
Effective date: Nov. 30, 1966.
Miscellaneous (principally Persian Gulf and Atlantic ports of Spain): Dec. 1, 1966
Effective date: Jan. 31, 1967.
Routes on which only one U.S. flag carrier now performs service: Jan. 2, 1967
Effective date: March 1, 1967.

Shelter Development Program Underway

The Tactical Air Warfare Center (TAWC) and the Air Proving Center (APGC) have embarked on a two-fold shelter program at Eglin AFB, Fla. There is an urgent need to improve and modernize portable buildings by generally keeping pace with improvements already made possible with new materials and methods of construction. These shelters would be used as hangars, maintenance and storage buildings, sleeping quarters, etc.

One part of this two-fold program is to develop shelters, or a family of shelter which, because of the requirement, necessitates a two- or three-year development period. The second, more immediate in nature, involves the procurement for environmental and functional testing of readily available shelters which potentially are superior to those presently being used but may not satisfy long-range requirements.

One such shelter which is presently undergoing tests is the Walter Kidde. This shelter comprises a weatherproof cover supported by inflated tubular structural members. The structural members are flexible and, when inflated with compressed air, they become load-bearing struts which assume a hemispherical shape with each end anchored to the ground. There are full-width openings at each end and vehicle and personnel openings at each side.

Mr. J. F. Huggins at the Climatic Laboratory Project Support Office is the APGC project officer. Major R. F. Arndt is TAWC project officer.

Booklet on O-Ring Compounds Available

"Know Your O-Ring Compounds," a booklet compiled by the Defense Industrial Supply Center (DISC), Philadelphia, Pa., is now available to research and development activities to assist them in designation selections of preferred items of supply.

The pamphlet provides a cross-reference between O-Ring fabricators' synthetic rubber compound designations and Government specifications and standards.

Through the use of information compiled for this publication, technicians have been able to broaden the procurement base for DISC-managed items, and to provide acceptable substitutes in the Item Entry Control Program.

Data for the publication were provided through the cooperation of commercial sources and the Military Service engineering support activities. Accumulation of data will continue to permit updating and expansion of the cross-reference document in the future.

Copies of the booklet may be obtained by writing to:

Commander
Defense Industrial Supply Center
700 Robbins Ave.
Philadelphia, Pa. 19111

DOD Creates New Directorate To Deal with Food Policies

A Directorate for Food Service Management Systems has been established in the Office of the Assistant Secretary of Defense (Installations & Logistics) to serve as the focal point on all matters pertaining to military feeding.

The primary mission of the new directorate is to formulate uniform food rationing and food service policies for all branches of the Armed Forces.

Creation of the new directorate was the result of a study of food rationing and food service management systems within the Military Services.

The study revealed that the food service program of the Armed Forces is the largest in the United States and pointed out the need for a centralized organization to deal with food service and management problems at the policy level.

The directorate is headed by Captain James A. Warren, USN, and staffed with senior officers from each of the Military Services and a civilian specialist in feeding and systems management.

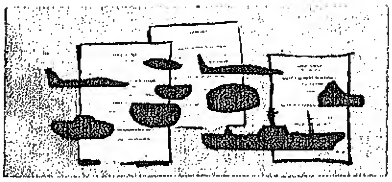
Wire Rope Specs To Change

The Defense Industrial Supply Center (DISC), Philadelphia, Pa., has adopted a suggestion by the wire rope industry to use polypropylene cores in the manufacture of wire rope.

DISC, a field activity of the Defense Supply Agency, has in the past used natural fibers as cores for wire rope.

The center decided to switch to polypropylene after a study revealed that natural fiber centers in wire rope were required only by Government sources. Further, it was determined that, since polypropylene centers are used for all commercial applications, the Government would profit through faster deliveries, lower prices and better quality by changing.

Negotiations have been initiated by DISC with military users to revise specifications to permit the use of the polypropylene centers. Manufacturers of wire rope for the Government have been furnished new and revised specifications.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of July 1966:

DEFENSE SUPPLY AGENCY

1—Raylon Corp., B. G. Colton Textiles, New York City. $1,184,856. 605,700 yards of cotton and nylon oxford cloth. New York City. Defense Personnel Support Center, Philadelphia.

—Society Brand Hat Co., St. Louis. $1,929,-910. 420,240 wool serge service caps. St. Louis. Defense Personnel Support Center, Philadelphia.

—Pettibone Mulliken Corp., Washington, D.C. $3,999,963. 256 diesel forklift trucks. Washington, D.C. Defense General Supply Center, Richmond, Va.

—The following contracts have been awarded by the Defense Fuel Supply Center, Alexandria, Va., for fuel oil and gasoline:
Shell Oil Co., New York City. $2,557,107; Standard Oil Co. of California, San Francisco. $1,244,155: Armour Oil Co., San Diego, Calif. $1,118,793.

—The following contracts have been awarded by the Defense Fuel Supply Center, Alexandria, Va., for lubricating oils:
Standard Oil Co. of Calif., San Francisco. $2,200,297. 4,037,069 gals.
Texaco, Inc., New York City. $1,439,771. 2,355,110 gals.
Delta Petroleum Co., New Orleans. $1,-395,721. 2,420,069 gals.

—Phipps Products Corp., Boston, Mass. $1,-027,082. 1,925,982 gallons of petro-chemicals. Defense Fuel Supply Center, Alexandria, Va.

5—Wheeling Steel Corp., Wheeling Corrugating Div., Wheeling, W. Va. $8,796,000. 24,000 metal shipping boxes. Wheeling. Defense General Supply Center, Richmond, Va.

—Fruehauf Corp., Military Products Div., Fullerton, Calif. $10,995,930. 26,278 metal shipping boxes. Fullerton. Defense General Supply Center, Richmond, Va.

—Dow Chemical Co., Midland, Mich. $3,-830,568. 505,532 gallons of herbicide. Midland. Defense General Supply Center, Richmond, Va.

—Eastman Kodak Co., Rochester, N.Y. $1,-327,763. 27,200 rolls of aerial protographic film. Rochester. Defense General Supply Center, Richmond, Va.

—Cable Raincoat Co., Boston, Mass. $1,050,-400. 80,000 men's lightweight raincoats. Boston. Defense Personnel Support Center, Philadelphia.

—Royal Lubricants, Hanover, N.J. $1,444,-020. 428,461 gallons of aircraft turbine engine lubricating oil. Hanover. Defense Fuel Supply Center, Alexandria, Va.

6—Klopman Mills, Inc., New York City. $1,-607,455. 3,986,250 yds of polyester cotton broadcloth. New York City. Defense Personnel Support Center, Philadelphia.

—Erwin Mills, New York City. $1,148,660. 573,100 bed sheets. New York City. Defense Personnel Support Center, Philadelphia.

—Airosol Co., Neodesha, Kan. $1,427,800. 2,200,000 cans of insect repellant. Neodesha. Defense General Supply Center, Richmond, Va.

7—The Defense Personnel Support Center, Philadelphia, has awarded the following contracts for combat boots:
Sportwelt Shoe Co., Nashua, N.H. $5,-946,442. 530,000 pair.
Cumberland Shoe Co., Franklin, Tenn. $1,930,829. 163,200 pair.
H. H. Brown Shoe Co., Worcester, Mass. $4,306,600. 396,000 pair.
Endicott Johnson Corp., Endicott, N.Y. $1,861,489. 179,000 pair.
International Shoe Co., St. Louis. $1,-947,499. 200,000 pair.
Safety First Shoe Co., Nashville, Tenn. $2,997,500. 330,000 pair.
B. B. Walker Shoe Co., Asheboro, N.C. $1,923,250. 175,000 pair.
Brown Shoe Co., St. Louis. $3,305,600. 320,000 pair.
Addison Shoe Corp., Wynne, Ark. $3,-416,000. 350,000 pair.
Carolina Shoe Co., Morganton, N.C. $1,-240,139. 120,000 pair.
Weinbrenner Division of Textron, Inc. Milwaukee, Wis. $2,438,832. 231,600 pair.

8—Ingersoll Products Division of Borg-Warner Corp., Chicago. $1,614,724. 477,360 steel helmets. Chicago. Defense Personnel Support Center, Philadelphia.

11—Rubber Fabricator's Inc., Grantsville, W. Va. $1,276,700. 170,000 pneumatic mattresses. Grantsville. Defense Personnel Support Center, Philadelphia.

12—Virginia Tent & Awning Co., Norfolk, Va. $2,637,270. 12,000 general purpose tents. Norfolk. Defense Personnel Support Center, Philadelphia.

—Peoples Co., Huntington, W. Va. $2,246,-572. 10,700 general purpose tents. Huntington. Defense Personnel Support Center, Philadelphia.

—South Jersey Clothing Co., Minotola, N.J. $1,001,200. 50,000 men's wool serge coats. Minotola. Defense Personnel Support Center, Philaldelphia.

15—Clark Wire Corp., Cleveland, Ohio. $1,369,-352. 141,500 coils of concertina barbed wire. Cleveland. Defense Construction Supply Center, Columbus, Ohio.

20—Ansul Co., Marinette, Wis. $1,915,200. 400,000 gallons of herbicide. Marinette. Defense General Supply Center, Richmond, Va.

21—Longview Fiber Co., Longview, Wash. $1,-044,576. 2,142,105 fiberboard boxes and sleeves. Longview. Defense Personnel Support Center, Philadelphia.

22—Interstate Bakeries Corp., Kansas City, Mo. $1,230,555. 22,579,008 cans of white bread. Defense Personnel Support Center, Philadelphia.

25—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP-4 jet fuel:
Sinclair Refining Co., New York City. $4,338,600. 42,000,000 gallons.
Sun Oil Co., Philadelphia. $3,269,600. 31,500,000 gallons.
Humble Oil & Refining Co., Houston, Tex. $2,583,000. 25,200,000 gallons.
Cities Service Oil Co., New York City. $1,145,476. 10,500,000 gallons.

27—Camel Mfg. Co., Knoxville, Tenn. $3,088,-680. 12,000 general purpose tents. Defense Personnel Support Center, Philadelphia.

—American Tent & Canvas, Inc., LaFollette, Tenn. $2,030,670. 9,000 general purpose tents. Defense Personnel Support Center, Philadelphia.

—Wilson Mfg. Co., Wilson, N.C. $1,180,536. 5,600 general purpose tents. Defense Personnel Support Center, Philadelphia.

28—Gulf Oil Corp., New York City. $4,145,400. 42,000,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—Coastal States Petrochemical Co., Houston, Tex. $1,217,395. 11,760,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—Souhan-Kent Mfg. Co., Clifton Heights, Pa. $1,363,500. 300,000 yards of wool cloth. Clifton Heights. Defense Personnel Support Center, Philadelphia.

ARMY

1—Capital Radio Engineering Institute, Washington, D.C. $1,500,000. Classified services. Silver Spring, Md. Army Electronics Command, Fort Monmouth, N.J.

—Goodyear Tire & Rubber Co., Akron, Ohio. $5,630,243. Shoe assemblies for the M41 and M42 family of vehicles. Muncie, Ind. Army Tank Automotive Center, Warren, Mich.

—Presto-lite Co., Toledo, Ohio. $3,725,221. Volt batteries for general vehicle application. Toledo. Army Tank Automotive Center, Warren, Mich.

—Jordan Co. & Crown Construction Co Columbus, Ga. $3,788,990. Expansion of OCS facilities at Fort Benning, Ga. Engineer Dist., Savannah, Ga.

—Harvey Aluminum, Torrance, Calif. $1 580,000. Detonating fuzes. Torrance Frankford Arsenal, Philadelphia.

—Farrell Construction Co., Memphis, Tenn $1,031,608. Repair of hurricane damag in Hancock, Mississipi Project, Bay St Louis, Miss. Engineer Dist., Mobile, Ala

—Logistics Management Institute, Washington, D.C. $1,120,000. Fact finding ana lytical studies. Washington, D.C. Defens Supply Service.

5—Hamilton Watch Co., Lancaster, Pa. $3, 640,000. 106mm cartridge fuzes. Lancaster Frankford Arsenal, Philadelphia.

—General Time Corp., Westclox Div., La Salle, Ill. $3,922,297. 105mm cartridg fuzes. LaSalle. Frankford Arsenal, Philadelphia.

—Stewart & Stevenson Services, Houston Tex. $3,640,345. Generator sets. Houston Army Mobility Equipment Center, St Louis.

—Chandler Evans, Inc., West Hartford Conn. $1,509,905. Fuel control units fo UH-1 helicopters. West Hartford. Army Aviation Materiel Command, St. Louis.

—Eagle Picher Industries, Joplin, Mo. $1,-810,746. Wet batteries, primary type for Nike-Hercules. Joplin. Army Electronics Command, Philadelphia.

—General Electric, Lynchburg, Va. $1,572,-935. Furnishing and installing a wide band transmission system for a radio communication system. Kennedy Space Center, Merritt Island, Fla. Canaveral Engineer Dist., Merritt Island, Fla.

—Admiral Corp., Chicago. $3,960,927. Components of ARC-54 radio sets. Chicago. Army Electronics Command, Philadelphia.

—Collins Radio Co., Dallas, Tex. $1,204,053. ARC-54 radio sets. Dallas. Army Electronics Command, Philadelphia.

6—Herman H. West & Co., Murphy, N.C. $1,274,797. Clearance of 4,000 acres in connection with the Dworshak Dam and Reservoir Project. Near Lewiston, Idaho. Engineer Dist., Walla Walla, Wash.

7—Frecto Construction Co., Pittsburgh, Kan. $1,404,461. Construction in connection with the Stockton Dam and Reservoir Project. Near Greenfield, Mo. Engineer Dist., Kansas City, Mo.

—Garrett Corp., Air Cruisers Div., Belmar, N.J. $1,623,421. Inflatable shelters for the MUST (Medical Unit Self-Contained transportable). Belmar, N.J. and Buena Vista, Va. Research & Development Command, Office of the Surgeon General.

—Technical Operations, Inc., Burlington, Mass. $1,050,000. Provision of automatic data processing system support in connection with the development and design of USCONARC. Fort Monroe, Va. Purchasing Office, Fort Monroe, Va.

—Stolte & Santa Fe Engineers, Oakland, Calif. $1,234,000. Electric power, flood lights, security alarm system, test stand buildings, alterations to existing buildings and AC engine fuel system. Beale AFB, Calif. Engineer Dist., Sacramento, Calif.

—S. J. Groves & Son Co., Martinsburg, W. Va. $2,275,000. Construction of outlet works on East Lynn Reservoir, Twelve Pole Creek, W. Va. Engineer Dist., Huntington, W. Va.

8—FMC Corp., San Jose, Calif. $2,602,215. Anti-personnel XM595 projectiles. San Jose. Picatinny Arsenal, Dover, N.J.

—FMC Corp., San Jose, Calif. $3,528,526. 105mm anti-personnel projectiles. San Jose. Picatinny Arsenal, Dover, N.J.

—Northrop Corp., Nortronics Div., Anaheim, Calif. $3,711,194. 106mm anti-personnel projectiles. Anaheim. Picatinny Arsenal, Dover, N.J.

—Northrop Corp., Nortronics Div., Anaheim, Calif. $4,483,525. 105mm anti-personnel projectiles. Anaheim. Picatinny Arsenal, Dover, N.J.

—Burgess Battery Co., Freeport, Ill. $1,283,-360. Batteries used in the AN/PRC-4

radio. Freeport. Army Electronics Command, Philadelphia.

—Baltimore Contractors, Inc., Baltimore, Md. $6,208,000. Construction of a communication security production building for the National Security Agency. Fort Meade, Md. Engineer Dist., Baltimore, Md.

14—Massman Construction Co., Al Johnson Construction Co., and Peter Kiewit Sons' Co., Kansas City, Mo. $14,738,931. Work on Lock and Dam No. 14, Arkansas River, Arkansas and Oklahoma Project, Near Sallisaw, Okla. Engineer Dist., Tulsa, Okla.

—Maxson Construction Co., Dayton, Ohio. $1,346,670. Work on the Belleville Lock and Dam on the Ohio River, Parkersburg, W. Va. Engineer Dist., Huntington, W. Va.

—Mason & Hanger, Silas Mason Co., New York City. $4,190,175. Projectiles, Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

15—RCA, Camden, N.J. $21,000,000. Classified electronic equipment, Camden. Army Electronics Command, Fort Monmouth, N.J.

—Hughes Aircraft, Culver City, Calif. $4,736,028. FY 1967 follow-on research and development for the TOW Missile System. Culver City (76%) and Tucson, Ariz. Army Missile Command, Huntsville, Ala.

—Chrysler Motors, Detroit. $2,110,696. Cargo pick-up trucks with 4-door cabs. Warren, Mich. Army Tank Automotive Center, Warren, Mich.

—L. E. Mason Co., Hyde Park, Mass. $1,085,728. Fuzes, Hyde Park. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Trinity Construction Co. and Bauer Dredging Co., Houston, Tex. $2,987,200. Work on the Buffalo Bayou and Tributaries, Texas Project. Engineer Dist., Galveston, Tex.

Lawless and Alford, Inc., Austin, Tex. $1,617,010. Construction of masonry barracks buildings plus utilities at Fort Sill, Okla. Engineer Dist., Albuquerque, N.M.

—Bade Construction Co., Newport News, Va. $2,603,600. Construction work at Fort Eustis, Va. Engineer Dist., Norfolk, Va.

18—Holston Defense Corp., Kingsport, Tenn. $12,274,600. Various explosives, Kingsport. Ammunition Procurement & Supply Agency, Joliet, Ill.

19—Blount Bros. Construction Co., Montgomery, Ala. $16,373,000. Work on the Miller's Lock and Dam Power House Project. Millers Ferry, Ala. Engineer Dist., Mobile, Ala.

20—Manpower, Inc., Washington, D.C. $1,595,950. Kitchen police services for 24 mess halls serving enlisted students in the U.S. Army Engineer School, Fort Belvoir, Va. Army Engineer Center, Fort Belvoir, Va.

—Dravo Corp., S. J. Groves & Sons, C. H. Leavell & Co, Fishback & Moore and D-K-C Constructors. $131,216,955. Work on the Dworshak Dam and Reservoir, North Fork of the Clearwater River, Idaho Project. Near Lewiston, Idaho. Engineer Dist., Walla Walla, Wash.

—N. R. Hamm Contractors, Perry, Kan. $1,337,178. Work on the Shunganunga Creek Project. Topeka, Kan. Engineer Dist., Kansas City, Mo.

—Boyd Construction Co., Grenada, Miss. $2,650,080. Work on Lock and Dam No. 17, Verdigris River Project. Wagoner, Okla. Engineer Dist., Tulsa, Okla.

—General Electric, Burlington, Vt. $1,610,000. Spare parts for XM 12 armament pods. Burlington. New York Procurement Detachment.

22—Sperry Rand Corp., New York City. $30,966,686. Miscellaneous items of ammunition and manufacture of metal parts for 105mm and 155mm shells, Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Vinnell Corp., Alhambra, Calif. $9,328,735. Operation and maintenance of T-2 tankers and land electrical distribution systems, Vietnam. Army Mobility Equipment Center, St. Louis.

—Day & Zimmermann, Inc., Philadelphia. $22,027,983. Miscellaneous items of ammunition and components. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

25—Hendry Corp., Tampa, Fla. $3,729,700. New construction dredging of Palm Beach Harbor, Fla. Engineer Dist., Jacksonville, Fla.

26—General Electric, Pine Bluff, Ark. $1,487,083. Design, manufacture, delivery, installation and testing of generators with appurtenances for the Ozark Lock and Dam Project. Schenectady, N.Y. (manufacture); and Ozark, Ark. (delivery). Engineer Dist., Little Rock, Ark.

—Atlas Corp., H. C. Smith Construction Co., and Global Associates, Oakland, Calif. $10,000,000. Logistical support of the Kwajalein Test Site. NIKE X Project Office, Huntsville, Ala.

R&D Constructors, Chicago. $1,170,000. Construction of an aircraft corrosion control facility and maintenance dock. McGuire AFB, N.J. Engineer Dist., New York City.

27—Thomas Construction Co., Fresno, Calif. $1,660,110. Construction for the new Melones Reservoir Project. Stockton, Calif. Engineer Dist., Sacramento, Calif.

28—Olin Mathieson Chemical Corp., New York City. $16,424,798. Loading, assembling and packing miscellaneous propellant charges and bag loading. Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

29—Harvey Aluminum Sales, Inc., Torrance, Calif. $34,736,058. Loading, assembling and packing miscellaneous items of medium caliber ammunition and components. Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

Olin Mathieson Chemical Corp., New Haven, Conn. $1,428,775. Rifle barrels, New Haven. Springfield Armory, Mass.

General Time Corp., LaSalle, Ill. $2,557,200. Rocket fuzes, Peru, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

—American Machine & Foundry Co., Brooklyn, N.Y. $11,269,988. Metal parts for demolition bombs, Brooklyn. Ammunition Procurement & Supply Agency, Joliet, Ill.

R. G. LeTourneau, Inc., Longview, Tex. $9,466,537. Metal parts for demolition bombs. Longview. Ammunition Procurement & Supply Agency, Joliet, Ill.

A. O. Smith Corp., Chicago. $9,983,233. Metal parts for demolition bombs. Waco, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

TRW, Inc., Washington, D.C. $1,682,000. Implementation of an Integrated Management System in support of the Advanced Aerial Fire Support System. Washington, D.C. Harry Diamond Laboratories, Washington, D.C.

S. S. Mullen, Inc., and Dravo Corp., Seattle, Wash. $6,317,057. Construction of a multiproduct pipline from Whittier to Anchorage, Alaska. Engineer Dist., Anchorage, Alaska.

NAVY

1—Columbus Milpar & Mfg. Co., Columbus, Ohio. $9,768,849. Bomb fins. Columbus. Navy Ships Parts Control Center, Mechanicsburg, Pa.

North American Aviation, Columbus, Ohio. $3,340,766. Shipboard integrated operational intelligence center and photo interpretation complex, Columbus. Naval Air Systems Command.

North American Aviation, Columbus, Ohio. $10,649,970. Conversion of A 5A weapons systems to an RA-5C configuration. Columbus. Naval Air Systems Command.

North American Aviation, Columbus, Ohio. $4,100,000. OV 10A aircraft. Columbus. Naval Air Systems Command.

Sperry Rand Corp., Ford Instrument Co., Long Island City, N.Y. $2,645,000. Fire control computers for the Terrier and Tartar missile systems. Long Island City. Naval Ordnance Systems Command.

—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $10,421,136. TF30 P 3 engines and related equipment for the Air Force. East Hartford. Naval Air Systems Command.

—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $13,042,400. J52 P 8A engines for the Navy. East Hartford. Naval Air Systems Command.

—Lockheed Aircraft Corp., Lockheed Missiles & Space Co., Sunnyvale, Calif. $8,265,169. Construction of a deep submergence rescue vehicle. Sunnyvale. Naval Ship Systems Command.

—Standard Armament, Inc., Glendale, Calif. $1,265,320. Aircraft bomb ejector racks. Glendale. Navy Aviation Supply Office, Philadelphia.

5—Clavier Corp., Richmond Hill, N.Y. $1,792,518. Radar equipment for installation aboard naval ships. Richmond Hill. Naval Ship Systems Command.

—Boeing Co., Vertol Div., Morton, Pa. $54,323,312. CH-46A and UH-46A helicopters. Morton. Naval Air Systems Command.

—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. $74,105,495. A-6A aircraft. Bethpage. Naval Air Systems Command.

—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $8,570,000. UH-34D helicopters. Stratford. Naval Air Systems Command.

—Curtiss-Wright Corp., Wright-Aeronautical Div., Wood-Ridge, N.J. $1,000,000. Design, develop, fabricate, test and furnish a liquid metal regenerator system. Wood-Ridge. Naval Air Systems Command.

—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $17,118,276. J52 P 8A engines. East Hartford. Naval Air Systems Command.

—Martin-Marietta, Orlando, Fla. $11,250,190. WALLEYE guided weapons and related equipment. Orlando. Naval Air Systems Command.

—Douglas Aircraft, Long Beach, Calif. $44,321,550. A 4F and TA-4F aircraft. Long Beach. Naval Air Systems Command.

—General Electric, Johnson City, N.Y. $2,622,304. Automatic pilot control systems. Johnson City. Naval Air Systems Command.

—Control Data Corp., Howard Research Div., Arlington, Va. $2,037,425. Engineering and support services for Fleet Ballistic Missile training installations. Special Projects Office.

6—General Dynamics, Electric Boat Div., Groton, Conn. $53,842,783. Construction of two replenishment fleet oilers, Quincy, Mass. Navy Ship Systems Command.

—Hughes Aircraft, Culver City, Calif. $20,000,000. FY 1967 funding for the Phoenix missile system. Naval Air Systems Command.

—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $8,750,000. Continuation of design and development of the TF 30 P-8 engine. East Hartford. Naval Air Systems Command.

Teledyne Systems, Hawthorne, Calif. $1,019,839. CH 46A prototype self-contained navigation and short range station-keeping systems. Hawthorne. Naval Air Systems Command.

—Raytheon Co., Lexington, Mass. $4,094,073. Prototype development of a dual fire control system for Tartar ships. Lexington. Naval Ordnance Systems Command.

General Dynamics, Pomona, Calif. $1,422,834. Test and evaluation of improvements to the basic design of the Standard Missile. Pomona. Naval Ordnance Systems Command.

Westinghouse Electric, Undersea Div., Baltimore, Md. $3,119,000. Long lead time items for the MK 48 torpedo. Baltimore. Naval Ordnance Systems Command.

Lockheed Missiles & Space Co., Sunnyvale, Calif. $4,500,000. Support of the Polaris program. Sunnyvale. Special Projects Office.

Lockheed Missiles & Space Co., Sunnyvale, Calif. $3,972,000. Repair of Polaris missile equipment. Sunnyvale. Special Projects Office.

—VITRO Corp. of America, Silver Spring, Md. $6,812,582. Polaris system engineering services. Silver Spring. Special Projects Office.

—Lockheed Missiles & Space Co., Sunnyvale, Calif. $7,000,000. Tactical engineering services on the Polaris missile system. Sunnyvale. Special Projects Office.

7—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. $9,105,500. C-2A aircraft. Bethpage. Naval Air Systems Command.

—Raytheon Co., Lexington, Mass. $1,307,040. Long lead time materials and effort for production of Sparrow III guided missiles for the Air Force. Lowell, Mass. Naval Air Systems Command.

—Yardney Electric Corp., New York City. $2,663,775. Mark 46, Mark 53 and Mark 67 torpedo batteries. Pawcatuck, Conn. Navy Purchasing Office, Washington, D.C.

—Simplex Wire & Cable Co., Newington, N.H. $1,700,000. Array assemblies to be used in oceanographic research. Newington. Navy Purchasing Office, Washington, D.C.

—Machinery Associates, Inc., Narbeth, Pa. $1,045,420. Machines to be used in shop moderization programs. Fond du Lac,

Wis. Navy Purchasing Office, Washington, D.C.

11—Sperry Gyroscope Co., Syosset, L.I., N.Y. $4,326,987. Repair of fleet ballistic missile submarine navigation sub-system components. Syosset. Naval Ship Systems Command.

—Sperry Rand Corp., Univac Div., St. Paul, Minn. $2,719,123. Computers and related equipment and services for use on the Naval Tactical Data System aboard fleet ballistic missile submarines. St. Paul. Naval Ship Systems Command.

—General Electric, Light Military Electronics Dept., Utica, N.Y. $4,639,594. Guidance and control groups for Chaparral missiles for the Army. Utica. Naval Air Systems Command.

—Western Electric, New York City. $3,363,673 and $2,243,512. Classified research and development in oceanographic services. Whippany, N.J. Navy Purchasing Office, Washington, D.C.

—U.S. Steel, Pittsburgh, Pa. $1,042,661. Bullpup guided missile warheads. Pittsburgh. Naval Air Systems Command.

—Sanders Associates, Nashua, N.H. $1,120,122. Research and development on classified electronics equipment. Nashua. Naval Air Systems Command.

—Maxson Electronics Corp., Old Forge, Pa. $3,631,554. Bullpup missile parts. Old Forge. Naval Air Systems Command.

12—Lenkurt Electric Co., San Carlos, Calif. $1,358,559. Micro-wave system for communications. San Carlos. Navy Purchasing Office, Washington, D.C.

—Texas Instruments, Dallas, Tex. $3,570,817. Shrike missile guidance and control sections and airframes. Dallas. Naval Air Systems Command.

—Straightline Mfg. Co., Cornwell Heights, Pa. $1,792,745. Fin assemblies used with the Mark 81 Mod 1 bomb. Cornwell Heights. Navy Ships Parts Control Center, Mechanicsburg, Pa.

13—Astro-Science Corp., South El Monte, Calif. $1,620,665. Airborne sound recorder-reproducer sets for ASW data recording. South El Monte. Naval Air Systems Command.

—Sperry Rand Corp., Bristol, Tenn. $1,238,396. LAU34 missile launchers for use on A7A and F4 aircraft. Bristol. Navy Purchasing Office, Washington, D.C.

14—Tacoma Boatbuilding Co., Tacoma, Wash. $14,717,815. Five motor gunboats. Tacoma. Naval Ship Systems Command.

—Peterson Builders, Inc., Sturgeon Bay, Wis. $14,288,540. Five motor gunboats. Sturgeon Bay. Naval Ship Systems Command.

—McDonnell Aircraft, St. Louis. $96,400,000. FY 1966 procurement of F-4E, F-4J, F-4D and RF-4C aircraft. St. Louis. Naval Air Systems Command.

15—National Steel & Shipbuilding Co., San Diego, Calif. $249,110,996. Construction of 17 tank landing ships. San Diego. Naval Ship Systems Command.

—General Dynamics, Electric Boat Div., Groton, Conn. $111,487,795. Design and construction of four nuclear powered attack submarines. Groton. Naval Ship Systems Command.

—Raytheon Co., Lexington, Mass. $4,599,994. Improved data converters, with associated ordnance alterations, spare parts and technical documentation for AN/SPG-51B radar sets. North Dighton, Mass. Naval Ordnance Systems Command.

—North American Aviation, Autonetics Div., Anaheim, Calif. $2,678,246. Repair of Ships Inertial Navigation Systems gyroscopes and velocity meters. Anaheim. Naval Ship Systems Command.

—Royal Industries, Engineered Products Div., Alhambra, Calif. $1,821,321. External auxiliary fuel tanks. Alhambra. Naval Air Systems Command.

—Norfolk Shipbuilding & Drydock Corp., Norfolk, Va. $1,328,000. Regular overhaul of the oiler USS TRUCKEE (AO-147). Norfolk. Industrial Manager, 5th Naval District.

18—Western Electric, New York City. $5,776,185. Design, construction, testing and installation of a submarine towed acoustic array system. Whippany, N.J. Naval Ship Systems Command.

—Texas Instruments, Inc., Apparatus Div., Dallas, Tex. $1,878,480. Spare parts for use on AN/APS-80 radar sets in P-3A aircraft. Dallas. Navy Aviation Supply Office, Philadelphia.

—Thiokol Chemical Corp., Reaction Motors Div., Denville, N.J. $5,255,840. Prepackaged liquid propellant rocket engines for BULLPUP missiles. Rockaway, N.J. Naval Air Systems Command.

—Corbetta Construction Co., Desplaines, Ill. $5,762,800. Construction of a barracks and mess hall at the Naval Training Center, Great Lakes, Ill. Midwest Div., Naval Facilities Engineering Command.

—Willamette Iron & Steel Co., Richmond, Calif. $1,394,477. Overhaul and repair of the attack transport USS MAGOFFIN (APA-199). Richmond. Industrial Manager, 12th Naval District.

19—General Precision, Inc., Librascope Group, Glendale, Calif. $5,706,000. Mk 48 torpedo fire control system modification kits and related equipment. Glendale. Naval Ordnance Systems Command.

—North American Aviation, Autonetics Div., Anaheim, Calif. $1,524,000. Evaluation and test program on ship inertial navigation system equipment. Anaheim. Naval Ship Systems Command.

—Sperry Gyroscope Co., Long Island, N.Y. $1,306,562. Various components of the inertial navigation subsystems of fleet ballistic missile submarines. Long Island. Naval Ship Systems Command.

—Todd Shipyards, San Pedro, Calif. $1,338,492. Regular overhaul of the landing ship, dock USS MONTICELLO (LSD-35). San Pedro. Naval Ship Systems Command.

20—Magnavox Co., Fort Wayne, Ind. $1,000,000. Modification kits and related equipment for airborne radar sets. Fort Wayne. Naval Air Systems Command.

—National Geophysical Co., Dallas, Tex. $2,508,240. Components of Mark 55 Mod 7 mines. Dallas. Naval Ordnance Plant, Louisville, Ky.

22—Curtiss-Wright Corp., Aeronautical Div., Wood-Ridge, N.J. $1,422,223. Kits for conversion of R3350-26 engines for use in A-1E/F/G/H aircraft. Wood-Ridge. Navy Aviation Supply Office, Philadelphia.

—North American Aviation, Autonetics Div., Anaheim, Calif. $3,281,175. Repair of ships inertial navigation systems. Anaheim. Naval Ship Systems Command.

25—Carrier Air Conditioning Co., New York City. $1,017,000. Air conditioning plants for submarines. Syracuse, N.Y. Naval Ship Systems Command.

—General Electric, Schenectady, N.Y. $19,147,440. Design and furnishing of Navy nuclear reactor compartment components. Schenectady. Naval Ship Systems Command.

—Sperry Gyroscope Co., Syosset, L.I., N.Y. $1,486,707. Submarine inertial navigation equipment. Syosset. Naval Ship Systems Command.

26—Nordic Construction Ltd., Honolulu, Hawaii. $1,074,500. Modifications to Commander-in-Chief, Pacific, Headquarters, Camp Smith, Hawaii. Naval Facilities Engineering Command.

27—Ampex International Operations, Inc., Redwood City, Calif. $1,135,131. Ampex tape recorder reproducer systems plus components and test equipment. Redwood City. Navy Purchasing Office, Brooklyn, N.Y.

28—Otis Elevator Co., Defense and Industrial Div., Brooklyn, N.Y. $2,421,351. Shipboard fire control system components. Brooklyn. Naval Ordnance Systems Command.

—Ryan Aeronautical Co., San Diego, Calif. $1,172,000. Installment funding for FIREBEE drones. San Diego. Naval Air Systems Command.

29—Boland Machine & Mfg., Inc., New Orleans, La. $1,723,321. Complete construction of a surveying ship. New Orleans. Naval Ship Systems Command.

—General Dynamics, New York City; Litton Systems, Inc., Culver City, Calif.; and Lockheed Shipbuilding and Construction Co., Seattle, Wash. (Each are receiving identical contracts for $5,275,000). Development of Fast Deployment Logistic Ship package proposals. Quincy, Mass., Culver City, Calif. and Arlington, Va. Naval Ship Systems Command.

AIR FORCE

1—Boeing Co., Seattle, Wash. $46,200,000. Modernization of MINUTEMAN Wing I. Malmstrom AFB, Mont. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—General Dynamics, Fort Worth, Tex. $3,731,367. Production of modification kits and related equipment for the B-58 aircraft flight control system. Fort Worth. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—Serv-Air, Inc., Vance AFB, Okla. $7,445,518. Support services for FY 67. Vance AFB. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—Pan American World Airways, New York City. $12,000,000. Management, operation and maintenance services for the Air Force Eastern Test Range, Patrick AFB, Fla. Air Force Eastern Test Range.

—Hercules, Inc., Wilmington, Del. $3,000,000. Rocket motors and related data for the MINUTEMAN missile. Kenvil, N.J. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

—Lear Siegler, Inc., Grand Rapids, Mich. $2,044,218. Production of aircraft bombing computers. Grand Rapids. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Lockheed Aircraft, Ontario, Calif. $7,000,000. Maintenance services during FY 67 for F-104 aircraft. Luke AFB, Ariz. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

5—Hazeltine Corp., Little Neck, L.I., N.Y. $1,404,668. Work on the MARK XII reentry vehicle. Little Neck. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Air Products & Chemicals, Inc., Allentown, Pa. $1,900,000. Relocation and modification of a liquid oxygen/nitrogen plant at Vandenberg AFB, Calif. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—Wilcox Electric Co., Kansas City, Mo. $4,336,000. Production of communications equipment. Kansas City. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—National Lead Co., Toledo, Ohio. $1,883,050. Production of bombs. Toledo. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Westinghouse Electric, Baltimore, Md. $3,778,594. Modification of search and height finder radars. Baltimore. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—Ling Temco-Vought Electrosystems, Inc., Greenville, Tex. $4,840,629. Inspection and repair services for F-102 aircraft. Greenville, S.C. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—Honeywell, Inc., Hopkins, Minn. $1,796,163. Increasing production equipment for the production of aircraft ordnance. Hopkins. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—General Electric, Cincinnati, Ohio. $1,796,840. Work on the advanced V/STOL program. Cincinnati. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Collins Radio Co., Cedar Rapids, Iowa. $1,305,097. Production of spare parts for Very High Frequency Communications Systems. Cedar Rapids. Warner Robins Air Materiel Area (AFLC) Robins AFB, Ga.

—Koehring Co., Springfield, Ohio. $1,324,092. Production of air cargo loading and unloading trucks. Springfield. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

6—Oshkosh Motor Truck, Inc., Oshkosh, Wis. $1,508,024. Overhaul of snow removal equipment. Oshkosh. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—VITRO Services, Eglin AFB, Fla. $9,090,287. Management and operation of land ranges and the Eglin Gulf test range for FY 1967. Air Proving Ground Center, Eglin AFB, Fla.

—Honeywell, Inc., Hopkins, Minn. $1,762,101. Engineering development of an anti-tank land mine. Hopkins. Air Proving Ground Center, Eglin AFB, Fla.

—AVCO Corp., Richmond, Ind. $4,087,000. Production of aircraft ordnance fuzes, containers and related equipment. Richmond. Aeronautical Systems Div. (AFSC), Wright-Pattern AFB, Ohio.

—Bendix Corp., Teterboro, N.J. $1,610,250. Production of electronic equipment for the C-141 aircraft. Teterboro. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Consolidated Diesel Electric Corp., Stamford, Conn. $1,774,444. Production of

trucks for loading and unloading aircraft cargo. Stamford. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—General Dynamics, Fort Worth, Tex. $3,618,420. Inspection and repair of B-58 aircraft. Fort Worth. San Antonio Air Materiel Area (AFLC), Kelly AFB, Tex.

—General Motors, Indianapolis, Ind. $4,669,215. Component improvement for the T-56 aircraft engine. Indianapolis. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Hughes Aircraft, Los Angeles. $1,861,097. Modification of Falcon aircraft missiles. Tucson, Ariz. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—I.B.M., Rockville, Md. $1,008,240. Maintenance and supply support for Air Force computers. Kingston, N.Y. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

—Magnavox, Fort Wayne, Ind. $1,162,000. Production of aircraft communications equipment. Fort Wayne. Warner Robins Air Materiel Area (AFSC), Robins AFB, Ga.

—Sanders Associates, Nashua, N.H. $1,470,293. Production of electronic equipment. Nashua. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Texas Instrument, Inc., Dallas, Tex. $2,272,837. Production of spare parts for the radar system on RF-4C aircraft. Dallas. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

—Batesville Mfg. Co., Batesville, Ark. $1,000,000. Production of bomb components. Batesville. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Polarad Electronic Corp., Long Island City, N.Y. $1,128,828. Production of communications equipment. Long Island City. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—North American Aviation, Canoga Park, Calif. $1,616,968. Production of 22 engines for THOR space boosters. Neosho, Mo. Space Systems Div. (AFSC), Los Angeles.

—North American Aviation, Autonetics Div., Anaheim, Calif. $3,974,181. Components of the improved Minuteman guidance system. Anaheim. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

7—Raytheon Co., Bedford, Mass. $1,184,433. Maintenance of the Rampart Radar Site, Holloman AFB, N.M. Missile Development Center, Holloman AFB, N.M.

—General Dynamics, Fort Worth, Tex. $1,639,861. Operation and maintenance of the Air Force Radar Target Scatter Site for FY 1967. Holloman AFB, N.M. Missile Development Center, Holloman AFB, N.M.

—General Electric, Syracuse, N.Y. $1,032,250. Modification of ground radar equipment. Syracuse. Air Proving Ground Center, Eglin AFB, Fla.

—AVCO Corp., Stratford, Conn. $1,250,000. Work on the MARK 11A reentry vehicle. Stratford. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—Continental Electronics Mfg. Co., Dallas, Tex. $1,481,716. Operation and maintenance of radar sites at White Sands Missile Range, N.M. Missile Development Center, Holloman AFB, N.M.

8—Aerojet General Corp., Downey, Calif. $6,250,000. Production of aircraft ordnance. Downey. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Federal Electric Corp., Paramus, N.J. $22,135,797. Operation and maintenance of DEWLINE, North Atlantic Radio System, and the communication and electronic system at Thule, Greenland. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

—Thiokol Chemical Corp., Bristol Pa. $45,018,011. Production of Stage I Minuteman missile motors. Brigham City, Utah. Ballistic Systems Div. (AFSC), Norton AFB, Calif.

—United Aircraft, Sunnyvale, Calif. $4,830,781. Production of napalm. Redwood City, Calif. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

—Dow Chemical Co., Midland, Mich. $2,033,726. Production of napalm. Torrance, Calif. Ogden Air Materiel Area (AFLC), Hill AFB, Utah.

—Sperry Rand Corp., Washington, D.C. $1,041,720. UNIVAC 1050 computer systems. Utica, N.Y. Wright-Patterson AFB, Ohio.

11—IT&T, Nutley, N.J. $8,884,097. Automatic digital stores and related equipment. Paramus, N.J. Electronics Systems Div. (AFSC), L. G. Hanscom Field, Mass.

—I.B.M., Washington, D.C. $1,370,000. Rental of electronic data processing equipment. Western Test Range, Vandenberg AFB, Calif.

—RCA, Moorestown, N.J. $1,360,000. Engineering analysis and technical services in support of the Ballistic Missile Early Warning System. $3,572,000. Maintenance of instrumentation radars. Eastern Test Range, Patrick AFB, Fla.

—General Electric, West Lynn, Mass. $7,313,532. Production of aircraft engines for T-38 and F-5 aircraft. West Lynn. $1,000,000. Production of aerospace ground equipment, Utica, N.Y. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Goodyear Aerospace Corp., Akron, Ohio. $4,400,000. Production of an air transportable photographic laboratory. Akron. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

—Aerospace Corp., El Segundo, Calif. $21,791,500. Scientific, engineering and technical services in support of space and ballistic programs. El Segundo. Space Systems Div. (AFSC), Los Angeles.

—Motorola, Inc., Chicago. $1,261,800. Production of ground ultra-high frequency radio equipment. Chicago. Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

12—General Electric, Syracuse, N.Y. $9,290,000. Operation and maintenance of the space tract sensor facilities at Shemya Air Force Station, Alaska. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

—RCA, Moorestown, N.J. $2,700,000. Operation and maintenance of the Moorestown Radar Tracker Sensor Facility. Sacramento Air Materiel Area (AFLC), McClellan, AFB, Calif.

—Boeing Co., Wichita, Kan. $9,757,655. Modification of B-52 aircraft. Wichita. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—IT&T, Nutley, N.J. $1,023,000. Production of air navigation equipment for the F-111 aircraft. Nutley. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

13—Metric Systems Corp., Fort Walton Beach, Fla. $1,563,116. Production of aluminum platforms. Fort Walton Beach. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.

15—RCA, Camden, N.J. $11,033,011. Operation, maintenance and logistic support of the White Alice Communications System for FY 1967. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

—IT&T, Paramus, N.J. $1,245,000. Management, operation, and maintenance of the common use facility of Air Force Plant 42 at Palmdale, Calif. Edwards AFB, Calif.

—Sanders Associates, Bedford, Mass. $1,631,200. Development of aircraft fuzes. Bedford. Air Proving Ground Center, Eglin AFB, Fla.

—Applied Technology, Inc., Palo Alto, Calif. $2,029,750. Electronic systems for F-100 and F-4 aircraft. Palo Alto. Warner-Robins Air Materiel Area (AFLC), Robins AFB, Ga.

18—Libby Welding Co., Kansas City, Mo. $1,471,124. Production of 193 generator sets (75KVA). Kansas City. Sacramento Air Materiel Area (AFLC), McClellan AFB, Calif.

19—Allis Chalmers Mfg. Co., Milwaukee, Wis. $6,361,344. Production and testing of electrical equipment and standby generators for Minuteman Missile Wing IV, Milwaukee. Corps of Engineers, Ballistic Missile Construction Office, Norton AFB, Calif.

20—General Dynamics, San Diego, Calif. $3,110,000. Value engineering incentive provisions for production of modification kits for external fuel tanks for F-106 aircraft. San Diego. San Antonio Air Materiel Area (AFLC) Kelly AFB, Tex.

21—North American Aviation, Autonetics Div., Anaheim, Calif. $3,470,338. Overhaul and repair of Hound Dog air-to-air missiles. Anaheim. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

22—Cleveland Pneumatic Tool Co., Cleveland, Ohio. $3,353,925. Production of landing gear components for KC-135 aircraft. Cleveland. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—IBM, Cape Canaveral, Fla. $1,631,568. Rental of automatic data processing equipment. Patrick AFB, Fla. Air Force Eastern Test Range, Patrick AFB, Fla.

—Ling-Temco-Vought Electrosystems, Greenville, Tex. $2,000,000. Production of airborne command and control systems. Greenville. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Bendix Corp., Baltimore, Md. $1,687,985. Production of transportable communication relay centers. Towson, Md. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

26—General Electric, West Lynn, Mass. $4,816,300. Production of T-58 engines for UH-1 and CH-3 helicopters. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Electronic Communications, Inc., St. Petersburg, Fla. $1,017,824. Production of communication and electronic equipment for KC-135 aircraft. St. Petersburg. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Boeing Co., Seattle, Wash. $3,700,000. Continuing development study and testing programs for the Minuteman Missile System. Seattle. Air Force Systems Command, Wright-Patterson AFB, Ohio.

—Cleveland Pneumatic Tool Co., Cleveland, Ohio. $1,874,000. Production of B-52 landing gear components. Cleveland. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

27—Lockheed Aircraft Service Co., Jamaica, N.Y. $1,795,122. Annual maintenance services for Special Air Mission aircraft for FY 1967. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Aerodex, Inc., Miami, Fla. $8,451,005. Overhaul of R-4360 reciprocating aircraft engines. Miami. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—Dallas Airmotive, Inc., Dallas, Tex. $2,830,133. Overhaul of R-2800 reciprocating aircraft engines. Dallas. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

28—Aerodex, Inc., Miami, Fla. $1,800,150. Overhaul of R-3350 reciprocating aircraft engines. Miami. Directorate of Procurement and Production, Kelly AFB, Tex.

—Ling-Temco-Vought, Inc., Greenville, Tex. $1,805,500. Modification of C-133 aircraft. Greenville. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—General Precision, Inc., Little Falls, N.J. $3,000,000. Production of components for airborne navigational computers. Little Falls. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—General Motors, Indianapolis, Ind. $1,598,000. Production of T-56 aircraft engine power sections. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Goodyear Aerospace Corp., Akron, Ohio. $1,150,000. Production of aerospace ground equipment to support airborne radar. Akron. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

29—Royal Industries, Inc., Engineered Products Div., Alhambra, Calif. $3,827,132. Production of external fuel tanks for F-100 aircraft. Alhambra. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

—Boeing Co., Seattle, Wash. $1,392,500. Engineering services in support of the Minuteman Missile System. Seattle. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—Honeywell, Inc., Arlington, Va. $2,880,030. Purchase of leased computer systems. Arlington. 2750th Air Base Wing, Wright-Patterson AFB, Ohio.

—North American Aviation, Autonetics Div., Anaheim, Calif. $1,004,500. Engineering services in support of the Minuteman Missile guidance system. Anaheim. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

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New Combat Communications Units To Streamline Forward Air Control

The Air Force's latest development in the field of forward air control was unveiled during roll-out ceremonies of a new jeep-mounted combat communications unit at General Dynamics' Electronics Division, Rochester, N. Y. The communications unit is a part of the 407L Tactical Air Control System managed by the Air Force Systems Command's Electronic Systems Division (ESD).

Developed for use by forward air controllers, the highly mobile units will help to streamline request channels for strike aircraft during close air support missions. Each jeep is equipped with four transceivers and associated antennas mounted on a base which can be removed and mounted on an armored personnel carrier or light truck.

Space is also provided in the jeep for two portable, battery-operated, manpack radio sets; one to communicate with ground troops and the other to direct aircraft. The jeep-mounted communications equipment includes four different type radios to enable forward air controllers to talk both to strike aircraft and to other ground troops. All equipment is located directly behind the vehicle seats.

The complete system with vehicle can be delivered by parachute, or the equipment and base can be quickly detached from the jeep and dropped separately. Powered by the vehicle's generator, the unit can also be operated in a semi-fixed mode from an auxiliary power generator mounted on an accompanying trailer.

In addition to furnishing equipment for direct air support, the 407L system is developing equipment groups for aircraft control and warning, air traffic control and command communications. Mobility, modularity and flexibility provide a capability for the system to operate in various locations depending on the required military mission.

Colonel George A. Guy, ESD system program director, explains the 407L as a two-step developmental program. The first step involves the acquisition of equipment presently within the state of the art to provide present tactical forces with an early increase in quantitative capability. Step two involves the development of improved systems utilizing new equipments such as lightweight radars, computer aided tracking and intercept procedures, and the use of improved materials, components and communication techniques.

DCAA Opens Contract Audit Institute at Memphis

The Defense Contract Aud Agency (DCAA) has establish a Contract Audit Institute Memphis, Tenn., using faciliti of the Defense Depot, Memphi a field activity of the Defen Supply Agency.

The new educational facili opened June 6 with a three-we course presenting technical or entation in the contract aud function to 60 newly employe graduates of college and unive sity accounting schools. Cours of various types related to co tract audit will be conducted o a continuing basis for the mo than 3,000 professional audito of the agency. Instructors wi be senior field auditors o DCAA.

The objective of the school i to advance the technical and a ministrative proficiency of co tract auditors through course developed from on-the-site situ tions and case studies, and t provide a training medium t adapt new auditing concepts t DCAA audit assignments.

DCAA is now responsible fo audit of contracts performed b more than 4,000 business ente prises, universities and othe institutions. It is the only agenc with which defense contractor deal concerning contract aud matters.

DEFENSE INDUSTRY BULLETIN

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DEFENSE

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REDUCTION · RIP · IN PAPERWORK

Article on page 27 by Mr. Clyde Bothmer, Executive Secretary, Defense Industry Advisory Council, covers actions being taken by the Defense Department and other interested organizations to reduce the paperwork burden on defense contractors and subcontractors.

Army Materiel Command To Reorganize Subordinate Units

Secretary of the Army Stanley R. Resor has approved an Army Materiel Command reorganization that will affect four subordinate units.

The shuffle calls for the phase out of the U.S. Army Mobility Command at Warren, Mich. As a result of the deactivation, the Mobility Command's three operating units, the Army Tank-Automotive Center, Warren; the Army Aviation Materiel Command and Army Mobility Equipment Center, both in St. Louis, Mo., will become separate elements reporting directly to Army Materiel Command headquarters in Washington, D.C.

Of the 180 civilian employees of the Army Mobility Command about 170 will be absorbed by the Army Tank-Automotive Center. The others will be offered positions with the Army Aviation Materiel Command, the Army Mobility Equipment Center, or with other subordinate elements.

The reorganization schedule, which calls for the deactivation of the Mobility Command by January 1967, began Aug. 1 when the Army Aviation Materiel Command and the Army Mobility Equipment Center became individual commands under their previous commanding generals.

When the transition is complete, the Army Tank-Automotive Center will be re-established as the Tank-Automotive Command under the direction of Major General W. W. Lapsley, who now heads the Mobility Command. Brigadier General W. J. Durrenberger, present Army Tank-Automotive Center commander will become Deputy Commander of the Army Tank-Automotive Command.

Air Force Reorganizes Tactical Air Command Centers

An Air Force reorganization of Tactical Air Command centers has resulted in the establishment of a Tactical Airlift Center at Pope AFB, N. C., and establishment of a Tactical Fighter Weapons Center at Nellis AFB, Nev. The new centers will minimize temporary assignment of personnel and equipment which are not available for normal mission during temporary duty periods.

The Tactical Airlift Center is collocated with an airlift wing at Pope AFB and next to the Army's XVIII Airborne Corps and the 82nd Airborne Division at Fort Bragg. This location will aid coordination of Army and Air Force testing of equipment and the development of tactics and techniques used in transporting and resupplying Army and Air Force troops by tactical aircraft.

At Nellis AFB the new Tactical Fighter Weapons Center will be the agency which will identify problem areas, test new equipment and develop new combat tactics for tactical fighters. Combat crew training and fighter weapons school classes presently conducted at Nellis will continue under the supervision of the center.

Under the reorganization of the centers, the Tactical Air Reconnaissance Center, Shaw AFB, S. C., will expand operational testing and evaluation of tactics and equipment used in tactical reconnaissance aircraft. At Eglin AFB, Fla., the Tactical Air Warfare Center will continue tests and evaluation of combat-improving projects which require specialized facilities of the Air Force Systems Command available at the base. No change is contemplated in the Special Air Warfare Center.

DEFENSE INDUSTRY

BULLETIN

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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Systems Analysis and Cost Effectiveness

by
Russell Murray II

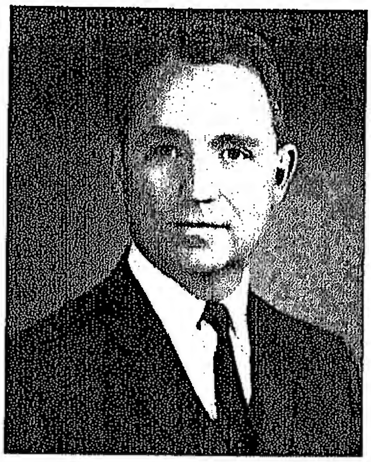
I am not enough of a historian to speak authoritatively as to the exact moment when systems analysis techniques were introduced into the defense business. But it is clear that the kind of questions addressed by systems analysis activities have been around for some time. For example, in Richard Hough's book, "Dreadnought," there appears the following extract from a report by Lieutenant Commander Sims to President Theodore Roosevelt at the turn of the century, concerning American battleship construction policy:

> "The final conclusion is, that for the sum that it would cost to maintain the twenty small battleships, we would maintain a fleet of ten large ones that would be greatly superior in tactical qualities, in effective hitting capacity, speed, protection, and inherent ability to concentrate its gunfire, and have a sufficient sum left over to build one 20,000-ton battleship each year, not to mention needing fewer officers and men to handle the more efficient fleet."

Though battleship construction policy is not our problem today, the whole tone of that quotation—the framing of the issue, the relationship between cost and effectiveness—has a remarkable ring of familiarity for today's systems analyst.

With the advent of World War II, the demand for activities in the general area of systems analysis grew sharply, and the groundwork was laid for its growth in the post-war period. Though the area of interest in World War II was narrowed by the urgencies of the situation, the intent was really no different than it is today. At that time, the emphasis was naturally on maximizing the effectiveness of existing forces; whereas, in the post-war era, the analysis could consider longer-ranged alternatives with significant differences in cost implications. Systems analysis began to expand from considerations of what we could do with what we had on hand at the moment to what we could do with what we might elect to have on hand in the future. Throughout this period, assuring the efficient utilization of resources in the DOD became progressively more difficult as a result—to coin a phrase—of mushrooming technology. The bewildering array of entirely feasible alternative forces which our scientists can offer today has enormously complicated our problems of choice. There is hardly a military task which cannot be accomplished in a multitude of ways—and many capabilities which we take for granted today have been wholly impossible over most of the span of military history. We cannot hedge against this array of possibilities by simply buying them all. To attempt to do so would only lead to squandering of resources on partially completed programs. Choices have to be made, and the aim of systems analysis is to help in making those choices correctly.

Just what systems analysis consists of is difficult to put into a few words, for it really is a blend of many things, and it draws on many of the formal disciplines. We do find, however, that



Russell Murray II serves as Dep. Asst. Secretary of Defense for General Purpose Programs (Systems Analysis). Mr. Murray, who has worked as a missile flight test engineer, joined DOD in 1962 as a consultant. Before assuming his present post in December 1965 he was Dep. Comptroller for General Purpose Forces.

economics is one of the most useful of the disciplines, since the core of systems analysis work centers on the economic problem of the efficient allocation of resources. Charles Hitch and Roland McKean, in their book "Economics of Defense in the Nuclear Age," had this to say on the subject:

> "The economic problem is to choose that strategy, including equipment and everything else necessary to implement it, which is most efficient (maximizes the attainment of the objective with the given resources) or economical (minimizes the cost of achieving the given objective)—the strategy which is most efficient also being the most economical.
>
> "Strategy and cost are as interdependent as the front and rear sights of a rifle. One cannot assign relative weights to the importance of the positions of the front and rear sights. It does not make sense to ask the correct position of the rear sight except in relation to the front sight and the target. Similarly one cannot economize except in choosing strategies (or tactics or methods) to achieve objectives. The job of economizing, which some would delegate to the budgeteers and comptrollers, cannot be distinguished from the whole task of making military decisions."

Much of the systems analysis work in the Defense Department utilizes an approach that is familiar to the economist. Nonetheless, it also involves considerations familiar to the engineer, the mathematician, the statistician and other professions. But one thing which it does not do is substitute for the decision maker. On the contrary, the whole aim is to present the decision maker with the clearest possible picture of what his choices really are—what each will do, when it will do it, and what it will cost. It also attempts to point out the uncertainties—to show what it would mean if uncertain key assumptions were changed, and to give a feeling for which factors are critical and which are not. To sort out those issues, to bring them into the open, to establish a forum for discussion along orderly lines, systems analysis has been found a useful tool in the Defense Department.

Systems analysis was formally introduced in DOD in 1961 when Charles Hitch, formerly the head of the Economics Department at The Rand Corporation, was appointed Comptroller. Within his organization, a systems analysis office was established at the level of a directorate. In 1962, this group had expanded and its

head, Dr. Alain Enthoven, was appointed a Deputy Assistant Secretary of Defense. With additional demands being placed on this group, and with analysis being applied to an increasingly wider scope of the Defense activities, in 1965 the systems analysis office, together with the existing cost estimation facility, was split from the Comptroller's office and established as a new office at the level of Assistant Secretary of Defense—this level, of course, reporting directly to the Secretary of Defense.

The Office of the Assistant Secretary of Defense (Systems Analysis) OASD(SA) is organized into five sections: one for strategic programs; a second for general purpose programs; a third for resource analysis (including cost estimation and manpower requirements); a fourth for economic analysis; and a fifth for command, control, communications and intelligence.

The office is closely integrated with other activities within the Office of the Secretary of Defense. For example, for expert advice and analysis of technological matters, we rely on the Office of the Director of Defense Research and Engineering. For matters relating to production scheduling possibilities and procurement policies, we rely on the Office of the Assistant Secretary of Defense (Installations and Logistics). And, of course, we work very closely with the Services and the Joint Chiefs of Staff. I would like to refer briefly to this relationship.

A portion of the analytical work done in DOD does take place within OASD(SA) proper. However, by far the largest fraction of the analytical effort is conducted by, or under the aegis of, the Services and the Joint Chiefs of Staff. In any program as overwhelmingly large as that of DOD, the opportunities for analysis are far beyond the physical capacity of OASD(SA), and our function is not to conduct all, or even an appreciable fraction, of the analyses that affect our defense planning. Rather, one of our major functions is to suggest to the Secretary of Defense those areas in which analysis would be profitable, i.e., areas adapted to analysis. The Secretary then considers our recommendations and, from time to time, requests the Services or the Joint Chiefs of Staff to conduct analyses. At that point, our function becomes one of working closely with the study organizations. If we can, we will work with the groups in selecting proper figures of merit and criteria, and we will try to help with the choice of assumptions. Above all, we will try to make sure that the analyses are directed along lines which will be responsive to the Secretary's needs.

In some instances, these analyses will be conducted by the military staffs. In others, they will be contracted out to organizations such as Rand, the Center for Naval Analysis, the Research Analysis Corporation, or the Institute for Defense Analysis. Though not all studies require it, it is generally at this stage that inputs of various kinds are solicited from industry and, in some cases, industry may conduct specialized studies for the various Services. I will have more to say later about the role I believe industry can play in this process.

When these studies are submitted to the Secretary of Defense, OASD(SA) participates in their review. In this function, we examine the studies in detail, and inform the Secretary as to our feelings as to their validity, what new information has been uncovered, what that implies for the future, and what we would recommend in that light with respect both to changes in defense planning and the need for any further analyses.

I think you should be able to appreciate from this that the use of systems analysis techniques in DOD has come of age. It now has become a way of life; its influence can be very great, and often is. But before I leave this point, let me hasten to add that although the value of such techniques has been recognized and accepted, their limitations have not been forgotten. Every person who works with or makes use of systems analysis techniques in the Office of the Secretary of Defense including the Secretary himself is aware of the limitations. It might be worthwhile mentioning four of the more important ones.

• First, analytical techniques are not a panacea. There will always be considerations which bear on the very fundamentals of national defense which are simply not subject to any sort of rigorous, quantitative analysis. It is not even possible to draw a line between those which are and those which are not. The gamut encompasses a wealth of considerations which are more or less subject to analysis. Thus, there will necessarily be questions which lie outside the scope of our analytical technique. For this reason alone, we cannot expect a panacea. But even if an entire issue cannot be resolved through analysis it is important to realize that every bit which can be confidently analyzed and interpreted removes one more bi[t] of uncertainty from the process o[f] making a choice.

• Second, because of the esoter[ic] aura surrounding the word "analysis," coupled with the fact that analyse[s] are conducted by human beings wit[h] human failings, the use of analyti[cal] techniques presents us with a poten[tial] hazard, as well as a potenti[al] benefit. I do not consider this a vali[d] reason for dismissing the utility o[f] analyses, for the hazards of non-ana[l]ysis are far greater. But it does ind[i]cate that the approach to analys[is] must never be casual it is a tool [of] great power, and it must be treat[ed] with respect.

• The third point is that syste[ms] analysis involves as much art as [it] does science. As an example, there [is] no standard method of evaluating t[he] military worth of a tactical aircra[ft] on a relative basis. This is not to s[ay] that we cannot make such compa[ri]sons, but that there is no single c[or]rect way. Accordingly, it is inevita[ble] that judgment is involved in det[er]mining how the analysis shall be c[on]ducted. The art of analysis requi[res] many talents and, as any art, i[s] perfected only through experience.

• Finally, on the fourth point, [the] state of the analytical art is in [an] early stage of development, and i[t is] only recently that the use of a[na]lytical techniques has begun to h[ave] a major effect on our defense st[ruc]ture. At present, we have far m[ore] questions which are amenable [to] analysis than we have experie[nced] analysts to work on them. [New] groups of analysts are being for[med] and gathering experience in pl[aces] where none existed before. In a[ddi]tion to the well established ce[nters] for analysis some of which [I] mentioned earlier many mil[itary] contractors have such groups as [part] of their organizations, though [our] experience is that they often r[eport] at too low a level to have a rea[l im]pact. I might note in that conne[ction] that the real benefit of a systems [anal]ysis facility can be realized only

is located next to the decision maker, where it can be responsive to his needs and aware of his problems. We find this to be the case in the Office of the Secretary of Defense, and I see no reason why it should not be equally true elsewhere.

On the other hand, I would not not want to give you the impression that systems analysis techniques are useful only at the highest levels. It is equally useful to decision makers on all levels as well as during all the chronological stages in the development of weapon systems. After all, what this sort of activity attempts to do is to reduce the uncertainties involved in making choices between alternatives. It is clear that choices are necessary not only for the user of military hardware, but also for the supplier—the prime contractors, the subcontractors and even the component specialists.

Furthermore, choices must be made continually as any given weapon system is developed, not only the basic decison to embark on the project, but later as the "paper" design is translated into hardware; still later, how to employ the system to best advantage and, in many cases, how to modify the system to take advantage of new technology or to extend its useful service life.

Thus, with choices to be made on all levels on a continuing basis, and not just at the "top," it is clear that the opportunities for benefiting from analytical techniques are extremely wide. It is for this reason that the generation of additional numbers of qualified analysts and further development of the art of analysis holds so much promise.

I would like to conclude by addressing the role that industry can play in this process, and I can think of at least three possibilities.

The first concerns a problem that we run into at the very earliest stages in the genesis of a new weapon system. Too often in the past, the requirement for a new weapon system has been stated in terms of rigid performance specifications. For example, the "requirement" will state that a new aircraft must have some specific payload, range, ceiling and speed capability; it must carry particular kinds of equipment which weigh just so much and do certain things; it must weigh no more than a certain specified amount, and so on. This sort of rigid performance specification may well be useful, or even essential (though I have more to say about this later) when the problem is to move one particular system into the hardware stage. But there is a very different problem which should be settled first: to select one particular system from among all the alternative systems which could also accomplish the specific military task. Before we can even get to the contract definition phase, we need to analyze and compare the alternatives, and this requires a far greater scope and flexibility than that provided by a rigid performance specification.

In the future, as in the past, the genesis of a weapon system will be marked by, and depend on, a bright idea in somebody's head. We will never find a substitute for that, though analysis can help guide our thoughts to where the bright ideas are waiting. The subsequent task is to subject the bright idea to the test of analysis in the form of a study, probably conducted under the auspices of one of the Services. At this point, what is needed is something which I believe industry is, or should be, ideally suited to provide: a catalog, if you will, of the kinds of alternative systems which could be made available. I do not mean a catalog without limits. Just how wide a range of alternatives that catalog should encompass would be determined by the Service organization reponsible for the systems analysis. That same organization would also have to decide how many different industrial firms should be solicited for such catalogs, and whether that should be done on a contracted basis.

On each page of that sort of catalog would be a description of one particular alternative: how long it would be before we could have it in service; some estimate of the technological risks involved; what its performance characteristics would be (including not only such things as range, speed and payload, but also reliability and maintainability); what its costs would be—to develop, to produce and to maintain and operate. Let me hasten to add that, at this stage in the development of a new system, the emphasis would be on covering a wide range of alternatives rather than on examination in detail.

Conventional design procedures leave much to be desired for this sort of activity. If each of a wide range of alternative systems has to be laid out in detail, with every nut and bolt in place, the time and cost involved in developing such a catalog would be prohibitive. What is needed, instead, is the development of new techniques for parameterized design. In this respect, my impression is that the aircraft manufacturers are ahead of most of the rest of industry. They use a technique called "rubberized design" which allows them, without even getting near to a drafting table, to stretch or shrink the various characteristics of a new aircraft design this way and that—increasing or decreasing the take-off distance, the range, the payload, the speed, finding out what this means in terms of size or gross weight, and so on—and doing this all on a rapid and, I might add, surprisingly accurate basis. It has taken time to develop this facility, and I would like to see it applied more widely for such catalog-building purposes. In addition to the rapid prediction of technical characteristics, a similar facility is needed for the prediction of costs. Both depend, of course, on historical analyses of earlier systems. A good deal of effort is now going into this sort of work, as I am sure you are aware, and I cannot overemphasize to you its importance to us.

The role that potential prime contractors would play in this building of catalogs is fairly clear—they would describe possible types of aircraft, ships, missiles and other major systems. The role played by the supplier of components, on the other hand, would seem to me to be in support either of the prime contractor or of the Military Service responsible for the systems analysis, with the component supplier's role becoming increasingly important as the gross characteristics of the new system begin to evolve.

The concept behind this development of catalogs is to allow a rational analysis of the alternatives. Before we can decide whether we should simply modernize the systems we already have, or whether we should build new ones, and, if so, what their characteristics should be, we need to know what the choices really are. We use systems analysis to help decide among these alternatives, or to suggest even better ones, but we cannot begin to apply

(Continued on Page 22)

New Navy Procurement Planning System Makes Government Business More Attractive

by
Capt. Joseph L. Howard, SC, USN

Defense contractors doing business with the Navy can look forward to more expeditious award of clearly defined contracts. Through increased emphasis on better procurement planning, Navy business will become more attractive to defense contractors. This will be made possible through the Navy's new Advance Procurement Planning System (APPS).

The keystone of the new APPS is the integration of contract considerations into the early weapon system planning cycle. The new system rests on two key principles: First, earlier procurement planning, intimately linked with early program planning; and second, a shift of responsibility for procurement planning from the supporting staff officials (contracting officers) to the actual system acquisition manager.

Under APPS the hardware manager must broaden his planning efforts to include not only the usual engineering and logistics aspects, but also the economic and contractual aspects. He must focus his attention not only on the final product but on how it will be obtained in the market place. Thus, the weapon systems planners are not planning in an "ivory tower" but are proceeding with a practical eye toward what they want and how they will get it most effectively and economically through the medium of the contract.

The trouble with the old approach, Vice Admiral I. J. Galantin, Chief of Naval Material said, is that engineering and logistic plans are greatly influenced—even thwarted, in extreme cases—by eventual purchasing requirements, over which the manager has little control. Conversely, purchasing may be "locked in," made inflexible, by engineering decisions made in a vacuum. As a result, the eventual contract may be advantageous neither to the contractor nor the Government.

To correct this, the Navy intends to introduce procurement considerations much earlier, even in the R&D planning phase and concept formulation phase, and is publishing procedural guidelines to be sure that it is done.

The new APPS does not affect the Navy's organization at all—it's just a matter of the same people doing the same things at different times. The Navy contracting Officer will, for example, begin thinking about the contractual approach much earlier in the weapon acquisition planning process. Likewise, the program planner will be thinking from the outset about the contract document as the medium through which he clearly communicates his requirements to the contractor.

The new system also reduces administrative procurement leadtime through the concurrent consideration of both technical and procurement factors—and by combining internal approval and procurement planning procedures.

The implications to defense industry suppliers are significant. The reduction in administrative procurement leadtime means that industry can look forward to earlier consummation of contracts. For example, contractors competing in contract definition (CD) will have a broader indication of what the Government visualizes in the program, both in terms of the requirement itself as well as the type of contractual arrangement contemplated. Contract terms could be worked out during the competition phase of CD and give a more complete

Capt. Joseph L. Howard, SC, USN, a veteran Navy Supply Corps officer with 26 years service, serves as Asst. Chief of Naval Material (Procurement) and Director of Procurement, Office of Asst. Secretary of the Navy (Installations and Logistics). He is author of a newly published book titled "Our Modern Navy."

basis for source selection. Carried to its ultimate, selection of source could be immediately followed by signing what is already a definitive instrument insofar as each competitor is concerned.

Participation in Navy contracts will also be more attractive because the new APPS gives developers a better chance at first production runs. APPS also is aimed at stimulating more competition initially for contract awards. Coupled with the developer's first production approach is a safeguard to assure that technical data are adequate to facilitate competitive procurement for later follow-on production.

Timely advance procurement planning will also increase competition through greater use of two-step formal advertising, rather than negotiation, as a method of procurement. In a similar manner, the new system will make possible the increased use of life-cycle contracting and, thereby help reduce maintenance and supply costs.

The gains for defense contractors from this more precise and comprehensive kind of program planning are many. Reduced administrative leadtime means more timely contracts. Better planning means clearer requirements spelled out in contracts. Source selection becomes easier. Developers will have a better chance for first production business. Competition will be improved among qualified companies. Technical data, a perpetual problem, will be more clearly defined. Improvements in contracting methods such as two-step formal advertising and multi-year procurement, will be routinely exploited by plan rather than by helter-skelter "add-ons" in the late procurement stages.

To the defense industry, the Navy's new APPS means more attractive business opportunities that lend themselves to better planning for the utilization of plant capacity. Vice Admiral Galantin confidently expects that all members of the Defense-industry team will benefit. Industry will gain from more orderly planning—the Navy will obtain better material, sooner for a

DEPARTMENT OF DEFENSE

Townsend Hoopes has been appointed Principal Dep. Asst. Secretary of Defense (International Security Affairs) succeeding Adam Yarmolinsky, who is leaving Government service.

VAdm. Kleber S. Masterson, USN, has turned over command of the U.S. Second Fleet to VAdm. Bernard A. Clarey and assumed the post of Director, Defense Weapons Systems Evaluation Group.

Maj. Gen. William T. Smith, USAF, became Chief of Staff, Defense Communications Agency Aug. 1, succeeding Brig. Gen. James H. Weiner, USAF, who has retired.

Maj. Gen. Ethan A. Chapman, USA, has been reassigned as Commanding General, Western Region, NORAD, headquartered at Hamilton AFB, Calif. He relieves retiring Maj. Gen. Andrew R. Lolli, USA.

Brig. Gen. John D. Crowley, USA, succeeds Brig. Gen. Raymond C. Conroy, USA, as Commander, Western Area, Military Traffic Management and Terminal Service, Oakland, Calif.

Brig. Gen. Thomas L. Hayes, USAF, has been appointed to the post of Dep. Commander for Management and Systems, Military Traffic Management and Terminal Service.

Col. Joel B. Stephens, USA, has assumed the position of Director for Community Relations, Office of Asst. Secretary of Defense (Public Affairs). He replaces Col. Julian B. Cross, USAF, deceased.

Capt. Frank Larsen, USN, has been appointed Chief, Office of Industrial Security, Defense Contract Administration Services (DCAS), Defense Supply Agency. He succeeds Col. James S. Cogswell, USAF, who has been designated as Special Assistant to the Dep. Dir. for DCAS.

Col. Theodore Antonelli, USA, has been named Dir. of the Office of Research & Systems, Military Traffic Management and Terminal Service.

Col. Leon Stann, USAF, has been designated Dep. Commander, Defense Fuel Supply Center. He has been serving as Acting Commander since the hospitalization of RAdm. Winston H. Schleef, SC, USN.

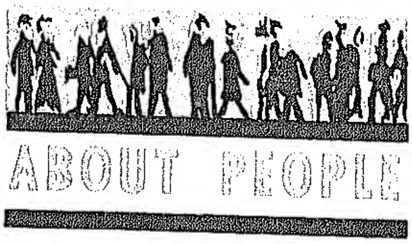
Capt. Robert R. Campbell, SC, USN, has been named Dep. Commander, Defense Electronics Supply Center, Dayton, Ohio.

Capt. Carl J. Stringer, SC, USN, is the new Dep. Commander, Defense Supply Depot, Mechanicsburg, Pa.

Col. Paul A. Legg, USAF, has been assigned as Dir., Office of Planning & Management, Defense Electronics Supply Center, Dayton, Ohio.

Col. George D. Mobbs, USAF, has been named Dir. of Value Engineering, Office of Asst. Secretary of Defense (Installations & Logistics).

Col. Milton Frank, USAF, has been named Chief of Public Affairs for the North American Air Defense Command. He takes over for Col. Harold Woodruff, USAF, who is retiring.



DEPARTMENT OF THE ARMY

Maj. Gen. Robert F. Seedlock has been named Dir., Military Construction, in the Office of the Army Chief of Engineers. He succeeds Brig. Gen. John C. Dalrymple, who has been reassigned to the Office of the Dep. Chief of Staff (Logistics), Dept. of the Army.

Maj. Gen. Roland B. Anderson, Commanding General, Army Weapons Command, Rock Island, Ill., has been reassigned to the Office of the Asst. Secretary of the Army (Installations & Logistics) as Dir., Army Procurement.

Former Dir. of Army Research Maj. Gen. Walter E. Lotz Jr., has returned from duty in Vietnam to become Chief of Communications-Electronics, Dept. of the Army.

Brig. Gen. Horace G. Davisson, recently nominated for a second star, has been assigned as Dep. Commanding General, Army Weapons Command, replacing Brig. Gen. Charles M. Prosser who will retire from the Army.

Brig. Gen. James A. Hebbeler is the new Dir. of the Chemical-Biological-Radiological and Nuclear Operations in the Office of the Asst. Chief of Staff (Force Development), Department of the Army.

Brig. Gen. John K. Boles Jr., has assumed new duties as Dep. Commanding General, Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

Dr. George W. Howard has retired as Technical Dir. of the Army Research & Engineer Research and Development Laboratories, Fort Belvoir, Va., ending a 35-year military civilian career.

Col. John S. Chambers Jr., became Commanding Officer of Picatinny Arsenal, Dover, N.J., upon retirement of Col. Henry W. Wishart.

Col. Harry L. Bush has assumed command of the Army Aviation Materiel Laboratories, Fort Eustis, Va., succeeding Col. John L. Klingenhagen.

The following staff assignments within the Office of the Chief of Research & Development, Department of the Army, are announced:

Col. Robert K. Moore has been appointed Chief, Air Mobility Div., Development Directorate; **Col. John E. Kuffner** has been appointed Chief, Nuclear, Chemical-Biological Div., Missiles & Space Directorate; **Col. George Sammett Jr.,** has been appointed Executive, Office of the Chief of Research & Development; **Col. John F. Kuznicki** has been appointed Chief, Review & Analysis Div., Plans & Programs Directorate.

DEPARTMENT OF THE NAVY

RAdm. Charles E. Loughlin has been assigned as Commandant, Naval Dist., Washington, D.C.

Capt. Martin D. Carmody has been assigned as Project Manager for the REWSON Project, Naval Material Command.

Capt. Burton H. Andrews has been reassigned as Dep. Dir., Laboratory Programs, Navy Material Command. He previously served in the Office of the Dir. of Defense Research and Engineering.

Capt. Charles W. Griffing, has been named Commanding Officer, U.S. Navy Space Systems Activity, Headquarters, Air Force Space Systems Div. (AFSC), Los Angeles, Calif.

Capt Lawrence Lovig Jr., SC, is the new Asst. Dep. Chief of Naval Material (Logistic Support).

Capt. Walter F. Mazzone, has taken over as Officer-in-Charge, Submarine Systems Project Technical Office, Navy Submarine Support Facility, San Diego, Calif.

Capt. Donald C. Stanley has been assigned as Commanding Officer, Naval Weapons Evaluation Facility, Kirtland AFB, N.M.

DEPARTMENT OF THE AIR FORCE

Lt. Gen. Thomas P. Gerrity, Dep. Chief of Staff, (Systems & Logistics), U.S. Air Force, has been assigned additional duty as Senior Air Force Member, Military Staff Committee of the United Nations.

Maj. Gen. Jack J. Catton, Dir., Aerospace Programs, U.S. Air Force, has been assigned additional duty as Asst. Dep. Chief of Staff, (Programs & Resources).

Brig. Gen. Horace D. Aynesworth has been reassigned as Dep. Dir. of Operations, (AFLC), Wright-Patterson AFB, Ohio, from duty as Asst. to the Dep. Chief of Staff (Plans & Operations), U.S. Air Force.

Col. Ralph A. Johnson has reported to Robins AFB, Ga., as Warner-Robins Air Materiel Area Director of Procurement and Production.

Col. Henry J. Mazur is the new Chief of the U.S. Strike Command System Program Office (492L) for the Electronic Systems Div. (AFSC), L. G. Hanscom Field, Mass.

Col. David V. Miller became Vice Commander, Space Systems Div. (AFSC), Los Angeles, Calif., Sept. 1.

Translation of Today's Ideas into Tomorrow's Aerospace Weapon Systems

by
Maj. Gen. Marvin C. Demler, USAF

The life expectancy of our nation in the decades ahead will depend on the success of translating ideas into new and improved aerospace weapon systems. The rapid application of ideas to the next generation of systems is a life-blood necessity for preserving the security of the free world in the international race for survival. Effective use of creative ideas hold the key to the future.

Translation of ideas into new weapon systems is the mutual concern of both the Air Force and industry. The Air Force Systems Command (AFSC) is responsible for advancing aerospace technology by acquiring the best possible aerospace systems for the nation. However, tomorrow's weapon systems cannot become a reality without industry's assistance. Industrial ideas are melded into Air Force needs by the Research and Technology Division (RTD) of the Air Force Systems Command.

In July 1962, RTD was established as a major step toward the improved management of Air Force research and development resources. Formation of the division resulted in strengthening the Air Force in-house laboratories by creating a broad base of military technology for timely application in systems development.

Initial action in the establishment of RTD was the consolidation of 30 small, scattered Systems Command laboratories into eight major Air Force laboratories and the Systems Engineering Group (SEG). The field organizations were regrouped by technical area under RTD to strengthen the Air Force in-house research and development capability and provide a focal point for information on all technological progress in industry, universities and research organizations (Figure 1).

The division assures effective coupling with the industrial and scientific community through the operation of Area and Host Scientific and Technical Liaison Offices (STLO's) strategically located in the United States, Canada and the Canal Zone. Area STLO's establish and maintain liaison with research and development organizations in a wide geographical zone but the coupling efforts of host offices are limited to activities at the assigned installations (See STLO listing on page 27).

The responsibility for providing laboratory support to existing and future systems through the AFSC systems divisions also assures that RTD is knowledgeable of all systems needs. RTD's close contact with the AFSC systems divisions facilitates rapid translation of ideas into weapon systems.

RTD functions like a computer by accepting diverse technical ideas and providing rapid read out of technology into a framework of meaningful exploratory and advanced development programs. The division manages, through its eight laboratories and SEG, 1,250 technical efforts with more than 8,000 research and development contracts at a total value in excess of $1.5 billion.

A major RTD objective is providing effective team leadership in using the

Maj. Gen. Marvin C. Demler, USAF, Commander, Research & Technology Div., Air Force Systems Command, has held key positions in the Air Force, research and development program since being commissioned in 1938. Prior to his present assignment he was Director of Advanced Technology, Hq., USAF.

nation's total scientific and technical resources in development of weapon systems. The division's range of interests in scientific and technical innovations has unlimited horizons, extending wherever there are ideas. The wide open RTD antenna is receptive to ideas from any person or organization associated with technology, particularly industry. What, then, is required to promote maximum cooperation for channelling valuable innovations from the bench scientist to the Air Force for quick application to existing and new weapon systems?

Maximum cooperation can begin with the widespread dissemination of Air Force requirements. In response, industry can evaluate its work in the research and development spectrum to select ideas for submission to the Air Force. RTD functions as a reception desk for ideas. Numerous methods are readily available for coupling industrial ideas to Air Force needs.

Knowledge of Air Force technical needs is essential for effective marketing of any innovation. Each year a series of Technical Objective Documents (TOD's) is prepared by Air Force laboratories identifying Air Force technical problem areas requiring the assistance of science and industry. Broad technical guidance not normally available elsewhere is contained in these documents to assist in research and development planning and submission of unsolicited proposals. The guidance includes significant information on specific program objectives, existing state of the art, technical forecast, and the responsible laboratory project officer for direct personal contact.

Any qualified organization in the scientific and industrial community with a research and development capability may request the documents. Requests for participation in the TOD Release Program should be submitted to Headquarters, Research and Technology Division.

Technical guidance on Air Force needs is also presented at numerous conferences during the year. For e

ample, early in 1966 the Commander, RTD, emphasized to defense contractors and potential contractors complete Air Force needs. He was part of a team which presented factual information on defense planning, policies and probable developments at the Advanced Planning Briefings for Industry at Boston, Atlanta, St. Louis, San Francisco and Washington, D.C. Large groups of management officials, research scientists and marketing experts from the entire spectrum of large and small business concerns attended the briefings sponsored by the Defense Department and the National Security Industrial Association.

RTD is a fisher for scientific and technical ideas through advance publication of future technical requirements in the U. S. Department of Commerce "Business Daily." A review of these synopsized requirements permits a rapid response to the RTD line of interests.

The RTD open house program of lectures and demonstrations provides an opportunity for attendees to become better acquainted with the division's key personnel, technical programs, capabilities, special equipment, facilities and support of systems divisions. The open house, originally designed for Government scientists, engineers and research and development administrators, has been expanded to include aerospace industries and university officials. The eyeball-to-eyeball contact at the lectures and demonstrations encourages industrial representatives to return home and evaluate their own laboratory efforts for possible application to Air Force needs.

Speeches by the Commander, RTD, and Dr. Leon Green, Jr., RTD Scientific Director, often emphasize technical areas of interest. Key speeches and presentations are frequently designed to trigger a response from industry with new and better ideas for the next generation of weapon systems.

RTD operates like a miner, descending into many laboratory veins in the nation focusing the Air Force headlamp to uncover ideas for use in weapon systems. Accordingly, the Air Force sponsors and co-sponsors many technical symposia each year in exploratory and advanced development program areas which attract a wide variety of scientific and engineering personnel across the country. The division has emphasized professional improvement programs for its key laboratory and management personnel which have included attendance at technical symposia. Attendance at the specialized symposia, such as the Annual Symposium on Space and Ballistics Missile Technology and the Materials Symposium provides unlimited opportunities for the exchange of new ideas with representatives of professional societies, industry and universities. Invitations to the technical symposia can be obtained from the professional societies sponsoring the event.

Publication of the *Research and Technology Briefs* magazine is a major division effort of identifying for industry in-house research and development efforts in progress. The *Briefs*, published each month as an unclassified document, contains scientific and technical articles, papers by leading Air Force laboratory personnel and a calendar of key scientific and engineering symposia and meetings. Research organizations may be placed on distribution for the *Briefs* by submitting a written request to RTD headquarters.

Research and Technology Division
Air Force Systems Command
Bolling AFB, Washington, D.C. 20332

Rome Air Development Center Griffiss AFB, N.Y. 13442	Surveillance Technology—Intelligence Collection and Processing Reconnaissance Data Handling — Communications — Computer Technology—Data Presentation—High Power Electromagnetic Technology.
AF Aero-Propulsion Laboratory Wright-Patterson AFB, Ohio 45433	Turbine Engines—Ramjet Engine Propulsion—Electric and Non-Chemical Advanced Propulsion Concepts—Power Generation Fuels and Lubricants—Aerospace Support Techniques.
AF Avionics Laboratory Wright-Patterson AFB, Ohio 45433	Navigation and Guidance—Reconnaissance Techniques — Aerial Surveillance — Laser Techniques—Electron Devices and Processes—Electromagnetic Warfare—Electromagnetic Environment—Aerospace Data Transmission.
AF Flight Dynamics Laboratory Wright-Patterson AFB, Ohio 45433	Structures — Flight Mechanics — Flight Control—Vehicle Dynamics—Environmental Control—Aerospace Vehicle Mechanical Systems—Recovery and Crew Station.
AF Materials Laboratory Wright-Patterson AFB, Ohio 45433	Structural Materials—Environmental Resistance—Materials for Seals, Sealants and Compliant Applications—Materials for Electromagnetic Applications—Materials for Energy Conversion, Transfer and Storage.
AF Weapons Laboratory Kirtland AFB, N.M. 87117	Nuclear Weapons Components—Biophysical Studies—Nuclear Power Applications —Environment Research—Nuclear Weapons Effects Research, Testing and Simulation.
AF Rocket Propulsion Laboratory Edwards AFB, Calif. 93523	Propellant and Combustion Technology—Liquid Rocket Technology—Solid Rocket Technology—Nuclear Rocket Technology —Aerospace Ground Equipment Technology—Rocket Propulsion Facility Technology.
AF Armament Laboratory Elgin AFB, Fla. 32542	Conventional Munitions—Chemical-Biological Technical Development—Target and Scoring Techniques.
Systems Engineering Group Wright-Patterson AFB, Ohio 45433	Systems Engineering and Technical Direction for Aeronautical Systems—Study and Analysis Support for AFSC and Other Government Agencies—Procurement Services for USAF Laboratories at Wright-Patterson AFB.

Figure 1.

(Continued on Page 27)

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OCTOBER 1966

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NOVEMBER 1966

SPEAKERS CALENDAR

DEPARTMENT OF DEFENSE

Maj. Gen. W. T. Smith, USAF, Chief of Staff, Defense Communications Agency, at Armed Forces Communications and Electronics Assn., St. Louis, Mo., Oct. 7.

Mr. B. B. Lynn, Dep. Dir., Defense Contract Audit Agency, at the National Contract Management Assn., Boston, Mass., Oct. 7; at the Long Island Chapter, National Assn. of Accountants, Long Island, N.Y., Oct. 18; at the National Assn. of Accountants, Chicago, Ill., Nov. 4; at the Electronic Industries Assn., Government Procurement Relations Dept., Colorado Springs, Colo., Nov. 17.

Lt. Gen. H. C. Donnelly, USAF, Dir., Defense Atomic Support Agency, at World Affairs Council Meeting, Pittsburgh, Pa., Nov. 17.

DEPARTMENT OF THE ARMY

Gen. Frank S. Besson Jr., Commanding General, U.S. Army Materiel Command, at Advance Planning Briefing for Industry (appearance only), Rock Island, Ill., Sept. 27.

Maj. Gen. Keith L. Ware, Chief of Information, at Association of the U.S. Army Annual Meeting, Sheraton Park Hotel, Washington, D.C., Oct. 10-12 (appearance only); at Eighth Annual Honors Luncheon of the Army Aviation Assn. of America, Shoreham Hotel, Washington, D.C., Oct. 14 (appearance only).

Brig. Gen. Lloyd B. Ramsey, Dep. Chief of Information, at Annual Assn. of the U.S. Army Meeting, Sheraton-Park Hotel, Washington, D.C., Oct. 10-12 (appearance only); at Reception by Army Aviation Assn. of America, Shoreham Hotel, Washington, D.C., Oct. 14 (appearance only).

Col. Thomas O. Blakeney, Director, Materiel, Army Combat Developments Command, Fort Belvoir, Va., at Advanced Planning Briefing for Industry, Rock Island, Ill., Sept. 27 (panel member).

DEPARTMENT OF THE NAVY

Hon. Paul H. Nitze, Secretary of the Navy, at Institute of Electrical and Electronic Engineers Annual Convention, Washington, D.C., Oct. 3; at Navy League Dinner, New York City, Oct. 26; at Navy Day Celebration, Charleston, S.C., Oct. 27.

Hon. Robert H. B. Baldwin, Under Secretary of the Navy, at National Maritime Union Convention, New York City, Oct. 4; at Propeller Club, Washington, D.C., Oct. 5; at Navy Day Luncheon, New Orleans, La., and Navy Day Dinner, Naval Air Station, Pensacola, Fla., Oct. 27; at Civil Service Board of Advisors Dinner, Pensacola, Fla., Oct. 28.

Admiral David L. McDonald, Chief of Naval Operations, at Propeller Club, Washington, D.C., Oct. 5; at Foreign Services Institute, Washington, D.C., Oct. 12; at Industrial College of the Armed Forces Meeting, Norfolk, Va., Nov. 3.

VAdm. I. J. Galantin, Chief of Naval Material, at Defense Weapon Systems Management Center, Wright-Patterson AFB, Ohio, Oct., 7; at American Management Assn., Washington, D. C., Oct. 17.

RAdm. H. A. Renken, Commander Service Force, Atlantic, at Sixth Regular Convention of the Navy League, Pompono Beach, Fla., Oct. 7.

Mr. Paul R. Miller, Asst. for Quality Control, Special Projects Office, at Region Two Conference of American Institute of Engineers, Atlantic City, N.J., Oct. 13.

Adm. Thomas H. Moorer, Commander-in-Chief, Atlantic Fleet, at Navy League & Kiwanis Club, Richmond, Va., Oct. 24; at Navy Day Luncheon, Philadelphia, Pa., Oct. 27.

DEPARTMENT OF THE AIR FORCE

Gen. J. P. McConnell, Chief of Staff, USAF, at Defense Orientation Conference, Washington, D.C., Sept. 30; at American Ordnance Assn. Meeting, Los Angeles, Calif., Oct. 5-6; at International Congress of Air Technology, Hot Springs, Ark., Oct. 28.

Hon. Robert H. Charles, Asst. Secretary of the Air Force (Installations and Logistics), at Institute of Government Contracts, Dallas, Tex., Sept. 30.

Hon. Norman S. Paul, Under Secretary of the Air Force, at National Space Club, Washington, D.C., Oct. 18.

Maj. Gen. H. B. Manson, Commander, Air Force Flight Test Center, Edwards AFB, Calif., at Trade Club Meeting, Bakersfield, Calif., Oct. 19.

Brig. Gen. L. A. Kiley, Commander Air Force Missile Development Center, Holloman AFB, N.M., at Inertial Guidance Symposium, Holloman AFB, Oct. 19-21.

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff, Systems and Logistics, at Air University, Maxwell AFB, Ala., Oct. 25.

Navy-Industry Conference on Systems Effectiveness Set

"The Impact of Systems Effectiveness Contracting," will be the theme of the Ninth Navy-Industry Conference on Systems Effectiveness to be held Oct. 25-26, in Washington, D.C.

The program for the conference, developed by the Naval Air Systems Effectiveness Advisory Board, will include such topics as, "The Impact of Reliability Demonstrations," "The Shape of Data Today and Tomorrow," "The Impact of Logistics and Support," and "Effective Reliability Management for Total Cost."

Speakers at this year's conference will include the Honorable Robert Frosch, Assistant Secretary of the Navy (Research and Development) Mr. George E. Fouch, Deputy Assistant Secretary of Defense (Installations and Logistics); Vice Admiral I. J. Galantin, Chief of Naval Material; and Rear Admiral J. P. Sage Assistant Commander, Material Acquisition, Naval Air Systems Command.

NOTICE

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The Importance of...
Responsibility Determinations

The following article by Captain Joseph L. Howard, SC, USN, Assistant Chief of Naval Material (Procurement), is reprinted from the Naval Material Command Procurement Newsletter. *While it was written for procurement personnel of the Navy, it is believed to be of interest to industry as well. The article reflects Defense Department policies and procedures regarding the determination of responsible contractors and is reprinted here for the information of prospective contractors.*

". . . nothing is more basic to satisfactory procurement than that we deal only with responsible prospective contractors."

Thus did Secretary of Defense McNamara point up the critical importance of source selection. Indeed, the selection of dependable sources of supply is the acid test of purchasing. No matter how well planned and designed a contract may be, if it is not awarded to a responsible supplier, it will not produce the materials or services required on time, and it will eventually increase costs to the Government. Default, late deliveries and other failures in contract performance invariably result in additional procurement and administrative costs. It is, therefore, imperative that contracts only be awarded to responsible prospective contractors.

False Economy. The award of a contract to a supplier based on price alone can be false economy if there is subsequent unsatisfactory performance under the contract. Contract awards to marginal suppliers based solely on the submission of the lowest bid or offer do not serve the objective of making Government purchases at the lowest price. Such awards act to increase the ultimate cost to Uncle Sam.

Minimum Standards. The minimum standards set forth in the Armed Services Procurement Regulation (ASPR) require that a responsible prospective contractor must:

- Have adequate financial resources, or the ability to obtain such resources as required during performance of the contract.
- Be able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing business commitments, commercial as well as governmental.
- Have a satisfactory record of performance.
- Have a satisfactory record of integrity.
- Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

Further, in procurements involving production, maintenance, construction, or research and development work, a prospective contractor must:

- Have the necessary organization, experience, operational controls and technical skills, or the ability to obtain them.
- Have the necessary production, construction and technical equipment and facilities, or the ability to obtain them.

While special standards of responsibility may be specified for certain procurements, a responsible prospective contractor is generally one who meets the standards set forth above.

An Affirmative Determination. The ASPR requires an affirmative determination in writing by the contracting officer that the prospective contractor is responsible before any contract award may be made. In expanding on this important point, the Secretary of Defense stated that ". . . there must be a positive judgment that he will perform the contract on schedule in accordance with its terms. This excludes the company whose qualifications are no better than borderline as to production capacity, financial capability, past performance, or any of the other minimum standards. It excludes the company whose continuing capability throughout the period of performance is jeopardized by a pending bankruptcy, reorganization, or other evidence of financial difficulty which may culminate in loss of needed financial capabilities during the period of contract performance. It means that, in predicting whether a company will perform the contract satisfactorily, it must be assumed that the Government will use vigilant and forceful contract administration. It is not acceptable to make a determination of responsibility which envisions completed contract performance only after extreme Government financial assistance and marked lenience in enforcing delivery schedules or other contract terms."

Some Exceptions. The ASPR provides that written determinations of responsibility need not be made in the case of:

- Purchases estimated to be $10,000 or less.
- Orders under existing Government contracts (except orders of more than $10,000 under basic ordering agreements).
- Contracts for perishable subsistence available for immediate shipment.

By now you are probably wondering when the contracting officer makes these determinations of responsibility and where he looks for information.

When Information Is Obtained. The ASPR provides that information necessary to make determinations of responsibility shall be obtained only concerning prospective contractors within range for an award and shall be obtained promptly after bid opening or receipt of proposals. However, in negotiated procurements, especially those involving research and development, such information may be obtained before the issuance of requests for proposals. At the same time, information concerning financial resources and performance capability should be acquired on as current a basis as is feasible with relation to the date of contract award. But, where does the contracting officer look for this information?

Where to Look. Information concerning contractor responsibility is available from a wide range of sources, including the following:

- The Joint Consolidated List of Debarred, Ineligible, and Suspended Contractors (see ASPR 1-601).
- Navy Contractor Experience List. This list is used by contracting officers as an aid in determining the current responsibility of suppliers and potential suppliers.
- The prospective contractor. Here it is significant to note that, according to the ASPR, "A prospective contractor must demonstrate affirmatively his responsibility . . ." The "burden of proof" for establishing the responsibility of a prospective contractor lies with the prospective contractor, not the contracting officer. Useful information is contained in bids and proposals, replies to questionnaires,

financial data, current and past production records, personnel records, etc.

• DOD records and personnel. Records on file and the knowledge of personnel within the purchasing office making the procurement, other purchasing offices, contract administration offices, etc.

• Publications, including credit ratings, trade and financial journals, business directories and registers.

However, it may be that these sources fall short of providing the contracting officer with enough information for a sound determination of responsibility.

Pre-Award Surveys. If the information available to the purchasing office is not sufficient to enable the contracting officer to make a determination of responsibility, a pre-award survey will call to the attention of the contract administration office any factors which should receive special emphasis. The ASPR also requires that, in procurements which are significant either in dollar value or in the critical nature of the requirement, consideration shall be given to requesting the contract administration office to verify information regarding current workload and financial capacity even though information available to the purchasing office concerning responsibility appears to be sufficient.

A Note on Small Business Concerns. If a contracting officer receives a responsive bid from a small business concern for a proposed award exceeding $10,000 and he has doubts as to the company's capacity or credit, he must have a pre-award survey made before determining that the company is not responsible for those reasons. If after receiving the results of the pre-award survey the procuring contracting officer determines that the small business concern is not responsible solely by reason of a lack of capacity or credit, he must refer the matter to the Small Business Administration (SBA).

If a certificate of competency is issued by SBA, it shall be accepted by the contracting officer as conclusive of a prospective contractor's capacity and credit. If the contracting officer still has substantial doubt as to the concern's ability to perform, the case must be forwarded through channels on an expedited basis to the Director of Procurement, Office of the Assistant Secretary of the Navy (Installations & Logistics), for review. Procurement action must be withheld pending receipt of instructions from that office.

Here are a few additional points on referrals to SBA:

• The contracting officer may, at his discretion, refer cases to the SBA where a bid or proposal of a small business concern for a proposed award exceeding $2,500 but not exceeding $10,000 is to be rejected solely because he has determined the concern to be nonresponsible as to capacity or credit.

• A referral need not be made to the SBA if the contracting officer certifies in writing that the award must be made without delay.

• A referral need not be made to the SBA if the contracting officer determines a small business concern nonresponsible for a reason other than lack of capacity or credit.

Determinations Will Be Supported. Contracting officers can expect to get high-level support of their responsibility determination decisions. Here are a few examples of the type of support they can expect:

From the Comptroller General of the United States:

> **"The projection of a bidder's ability to perform if awarded a contract is of necessity a matter of judgment. While such judgment should be based on fact and should be arrived at in good faith, it must properly be left largely to the sound administrative discretion of the contracting officers involved, since they are in the best position to assess responsibility, they must bear the major brunt of any difficulties experienced by reason of the contractor's lack of ability, and they must maintain the day-to-day relations with the contractor on behalf of the Government."**

From Graeme S. Bannerman, Assistant Secretary of the Navy (Installations and Logistics):

> **"It is our policy that contracts are to be awarded at the lowest sound price. This means that we intend to make awards only to the contractors who have established their technical and financial qualifications to make timely delivery of reliable equipment . . . We do not intend to do business with unqualified or marginal producers. There is no benefit to the Government in making an award to the lowest bidder unless he can deliver reliable equipment."**

From Vice Admiral I. J. Galantin, USN, Commander, Naval Material Command:

> **"We in the Naval Material Support Establishment must provide reliable, timely support to the fleet. Since much of our support is provided through contract, we must have reliable contractors. Contracting officers can be assured of my support in this endeavor."**

Decision making in any situation is the toughest management demand. To make a decision in the environment of contracting is doubly tough—and doubly important. A good decision is not an arbitrary decision, but one based on facts, and this is also the key in making good responsibility determinations. Get the facts. Make an honest decision. And you will be supported.

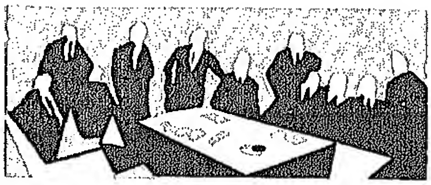
The importance of candid and correct responsibility determinations by contracting officers cannot be overemphasized—for the objective of a procurement action is not to produce a contract, but to produce the material required by our operating forces in a timely manner and at a reasonable cost to the United States taxpayers. This objective can be accomplished only if contracting officers assure that contracts are always placed in the hands of responsible contractors.

Gurnee to Head Contractor Cost Reduction Program

The responsibility for systems development and program review, formerly split between two staff offices, has been centered in the Office of the Deputy Assistant Secretary of Defense (Logistics Services), Office of Assistant Secretary of Defense (Installations and Logistics).

The Directorate for Cost Reduction Policy, which coordinates and administers the Defense Contractor Cost Reduction Program, will perform the functions for systems development and program review.

Commander Herbert L. Gurnee, SC, USNR, former head of the Navy's Cost Reduction Office, will head the Defense Contractor Cost Reduction Program.



MEETINGS AND SYMPOSIA

SEPTEMBER

Symposium on Galio-Arsenide, Sept. 26-27, in Reading, England. Sponsor: AF Avionics Laboratory, Research and Technology Div., Air Force Systems Command, Contact: R. W. Runnells (AVN), Air Force Avionics Laboratory, Research and Technology Div., (AFSC), Wright-Patterson AFB, Ohio 45433. (Area Code 513) 253-7111, ext. 5-3802 or 5-5362.

Sixth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Sept. 26-28, at Princeton, N.J. Sponsor: Naval Air Turbine Test Station. Contact: Dennis Wysocki, Conference Vice Chairman, Naval Air Turbine Test Station, P.O. Box 1716, 1440 Parkway Ave., Trenton, N.J. 08607. (Area Code 609) 882-1414, ext. 355.

Sixth Symposium on Naval Hydrodynamics, Maneuverability, Waves and Physics of Fluids, Sept. 29-30, Oct. 3-4, at Washington, D.C. Sponsor: Office of Naval Research. Contact: Mrs. S. W. Doroff, Office of Naval Research (Code 438), Washington, D.C. 20360. (Area Code 202) OXford 6-1433 or 6-6839.

OCTOBER

Tenth Annual Organic Chemistry Conference, Oct. 4-5, at Natick, Mass. Co-sponsors: Army Natick Laboratories and the NAS-NRC Advisory Board on Military Personnel and Supplies. Contact: Louis Long Jr., Head, Organic Chemistry Laboratory, Army Natick Laboratories, Natick, Mass. (Area Code 617) 653-1000, ext. 414.

Sixteenth Annual Symposium on U.S. Air Force Antenna Research and Development, Oct. 11-13, at the University of Illinois, Allerton Park, Ill. Sponsor: Air Force Avionics Laboratory. Contact: Mr. Turner (AVWE-3), Air Force Avionics Laboratory, Research and Technology Div., (AFSC), Wright-Patterson AFB, Ohio 45433. (Area Code 513) 253-7111, ext. 5-5720.

Classified Advanced Planning Briefing for Industry on Electronic Systems, Oct. 18-20, at Boston, Mass. Co-Sponsors: Air Force Electronic Systems Div., (AFSC) and National Security Industrial Assn. Contact: Paul A. Newman, NSIA Dept. N., Suite 800, 1030 15th St., N.W., Washington, D.C. 20005.

Colloquium on the Photographic Interaction Between Radiation and Matter, Oct. 26-27, at Washington, D.C. Co-sponsors: Air Force Office of Scientific Research and the Society of Photographic Scientists and Engineers. Contact: Dr. Amos G. Horney (SRC), Air Force Office of Scientific Research, Washington, D.C. 20333. (Area Code 202) OXford 6-8705.

NOVEMBER

25th Anniversary Symposium on Personnel Research and System Advancement, Nov. 1-3, at San Antonio, Tex. Sponsors: Personnel Research Laboratory and Southwest Research Institute. Contact: Jack Harman, Southwest Research Institute, San Antonio, Tex. (Area Code 512) OV 4-2000.

Ship Control System Symposia, Nov. 15-17, at Annapolis, Md. Sponsor: U.S. Navy Marine Engineering Laboratory. Contact: Walter J. Blumberg, Steering Committee Chairman, USN Marine Engineering Laboratory, Annapolis, Md. (Area Code 301) 268-7711, ext 8670.

Fifth Annual Symposium on Physics of Failure in Electronics, Nov. 16-18, at Columbus, Ohio. Co-Sponsors: Battelle Memorial Institute and the Rome Air Development Center. Contact: Joseph Schramp (EMERP); Rome Air Development Center, Griffiss, AFB, N.Y. 13442.

Third Annual Failure Analysis Seminar, Nov. 17-18, at the NASA Manned Spacecraft Center, Houston, Tex. Sponsor: Texas Chapter of the American Society for Metals and NASA-MSC. Contact: Dr. David E. Hartman, Houston Research Institute, Inc., 6001 Gulf Freeway, Houston, Tex. 77023. (Area Code 713) 928-5001.

Third Congress on Information Systems Science and Technology, Nov. 21-22, at Buck Hills Falls, Pa. Co-Sponsors: Electronic Systems Div., (AFSC) and Mitre Corp. Contact: Col. C. A. Laustrup (ESRC), Project Officer, Electronic Systems Div., (AFSC), L. G. Hanscom Field, Bedford, Mass. 01731. (Area Code 617) 271-4527.

Symposium on the Structure of Surfaces, date undetermined, at Durham, N.C. Sponsor: Army Research Office-Durham. Contact: Dr. H. M. Davis, Director, Metallurgy and Ceramics Div., Army Research Office -Durham, Box CM, Duke Station, Durham, N.C. 27706. (Area Code 919), 286-2285, ext. 31.

DECEMBER

15th Annual Wire & Cable Symposium, Dec. 2-9, at Atlantic City, N.J. Sponsor: U.S. Army Electronics Command. Contact: Milton Tenzer, Electronic Parts and Materials Div., Electronics Components Laboratory, U.S. Army Electronics Command, Fort Monmouth, N.J. 07703. (Area Code 201) 535-1834.

First Nuclear Criticality Safety National Topical Meeting, Dec. 13-15, at Las Vegas, Nev. Sponsors: American Nuclear Society and organizations and contractors of the Atomic Energy Commission, National Aeronautics and Space Administration and the Air Force. Contact: A. J. Smith, Nuclear Reactor Safety Group (WLAS-1), Air Force Weapons Laboratory, Kirtland AFB, N.M. 87117.

Warner Robins AMA Gets CV–2 Logistics Chores

Logistics support management of the CV-2 Caribou aircraft, which the U.S. Air Force will receive from the Army under an interservice agreement assigning responsibility for transport aircraft in combat zones to the Air Force, has been assumed by the Warner Robins Air Materiel Area, Robins AFB, Ga.

San Antonio Air Materiel Area, Kelly AFB, Tex., already inventory manager for the Pratt & Whitney R–2000 engine which powers the DeHavilland-manufactured CV-2, will provide logistics support for the engine.

Under the agreement, the Air Force will receive 144 Caribou aircraft.

Warner Robins will also manage logistics support of the DeHavilland CV–7 Buffalo, now in the research and development stage. No assignment has been made on the Buffalo's T–64 engine.

Navy Tests Automatic HELO Escape System

The U. S. Navy is testing a unique new helicopter fuselage capsule escape system which can be activated automatically by the pilot or one of the crew and does not require any action by passengers in an emergency.

The system begins operation when rotor blades are jettisoned to provide a clear area for parachutes to open. Next, the fuselage is severed to separate occupied and unoccupied sections. Separation rockets are ignited on the unoccupied portion thrusting it away to prevent collision between the sections. Parachutes bring the occupied fuselage section safely to earth.

H-25 helicopters, specially designed for remote controlled flight, are being used as test vehicles. The test program is being conducted by the Naval Aerospace Recovery Facility, El Centro, Calif.

FROM THE SPEAKERS ROSTRUM

Address by Dr. Chalmers W. Sherwin, Dep. Dir. (Research and Technology), Office of Dir. of Defense Research & Engineering, at meeting jointly sponsored by the Patent Law Assn. of Chicago and the Chicago Assn. of Commerce & Industry, Chicago, Ill., April 27, 1966.

Dr. Chalmers W. Sherwin

Project Hindsight Measuring the Payoff of Research and Technology to Defense

Early in 1964 we started to attack the problem of trying to assess the importance and value of research and technology to defense and to see if there is a favored way of managing it to produce high pay-off. After considerable discussion, we decided to focus on an examination of past accomplishments rather than the prediction of future ones. The reason for this decision was basically pragmatic. We believed that it took five to 10 years for discoveries or inventions to be applied to the Defense inventory and, thus, have their utility established unambiguously. We had to be certain that the accomplishments we focused on had an identifiable utilization. Scientists and engineers have a proclivity to wave their arms and point enthusiastically toward the future predicting great things for their recent pet discoveries and inventions, and they strain at the leash to spend the next billion dollars of research and technology money. Few, however, have any interest in what happened with the last billion dollars, not to mention the $10 billion which we estimate DOD has spent in this category since 1946. We wanted to find out what this large sum had accomplished and also to see if we could find any general lessons regarding its efficient management which might prove applicable today. We are particularly interested in principles which can be effected through policy actions in DOD.

Our approach is as follows: Select a recent weapon system (we took the Bullpup air-to-ground tactical guided missile as a pilot study), examine all of its subsystems and components and in each case ask, "What recent scientific knowledge or new technology is important to the increasing of the performance or reducing of the cost?" "Where was the work done?" "What motivated the creators?" "How was the research initially financed?"

Our first goal was to prove to ourselves that one could identify discrete research or exploratory development events (which we call RXD events) which are, in fact, clearly important to improving the cost effectiveness of the system.

(In DOD, the program we call exploratory development is largely technology.) In Bullpup, the ad hoc team in the Office of the Director, Defense Research and Engineering, identified 43 RXD events and ran down the essential background information on most of them. For example, one event (research category) was the development in 1942 of the theory of correlation, statistical filtering and prediction by Norbert Wiener. In 1950, this theory was applied at the Massachusetts Institute of Technology to radar signal detection using an electronic correlator (a second research event). In 1952, the correlator concept was used at the Martin Company to design an anti-jam radio guidance system as an alternate system for the Matador missile. (This extension of the concept to radio guidance is an exploratory development event.) When the Martin Company received the Request for Proposal for the Bullpup, they included the anti-jam radio link as part of their plan and, when Martin received the contract, it was incorporated into Bullpup.

I recite this history of three related RXD events not only to illustrate what we mean by RXD events, but also to illustrate several of the characteristics which our later studies confirm and illuminate. In 1942, Wiener was led into his basic theory because he had been worrying about the fire control problem for anti-aircraft guns. He was supported by a continuing Office of Scientific Research and Development contract at MIT. In 1950, Lee and Wiesner at the Research Laboratory for Electronics at MIT (a laboratory supported mainly by DOD sustaining program money), along with two graduate students (Cheatham and Singleton), were seeking to improve radar detection. They extended and interpreted the theory and demonstrated its application to the signal detection area. In 1952, Alpert at the Martin Company, who was supported by a combination of Matador guidance improvement funds and independent corporate funds, turned the MIT concept into an anti-jam radio control system.

What do we notice that these events have in common? First, they form a causally related chain with a thread of common personal communication. Second, all three events had to happen for Bullpup to get its jam-free control link. Third, the innovators were in each case directly exposed to urgent, real-life problems related to defense. Fourth, they were able to almost immediately pursue their ideas because locally controlled funds were available to carry them through the point of feasibility demonstration. Fifth, the initial job, and I stress initial, was done for a relatively small amount of money (less than $10,000 in each of these cases), illustrating that modest amounts of locally controlled funds available on short notice for research and technology are important, probably essential to innovation.

Each of these conclusions has been confirmed BY our current data base which is now over 10 times larger and includes information on eight additional systems. There seems to be a clear pattern in the successful application of innovative technology.

In addition to the three Bullpup events discussed above, there were 40 others which I cannot take the time to describe further. They ranged from the development of the thermal battery to new rocket engines and fuels, to new gyros and control systems. Again, we were examining new science and technology, a class that is generally described as "post World War II." Looking at the time history of the 43 events, it is significant that 23 of them occurred over a 12-year period, prior to the original 1954 development contract to the Martin Company, and 20 occurred afterward. The last one occurred in 1964, no less than 4 years after the second production contract! This shows how, if the management system permits it, there is a continual flow of innovating technology into a weapon system at all stages, continually upgrading its performance or reducing its cost. This situation, in which much further innovation is needed after system definition, was not due to poor planning. A 1953 Bureau of Aeronautics report (the Pitkin report) made a careful analysis of the system concept and concluded that the technology was in hand to do the job.

Let us look at some other features regarding the Bullpup events. An examination of funding sources shows that 74 percent of the events were funded by DOD dollars, 24 percent by corporate investment (mostly by defense industry) and two percent by foreign defense-oriented sources.

Eighty-seven percent of the events had as "targets" a Government system or technical problem, predominantly military, and no less than 38 percent were specifically directed toward the Bullpup system itself.

Nine percent of the events were in the research category (which is high, we have discovered since).

Universities were the originating source of six percent of the events, Government in-house laboratories 26 percent and industry 63 percent.

What has all this accomplished? We now have an operational missile which is several times as effective against defended point targets such as bridges, ships, etc., as compared to unguided bombs. What this means to military operations in terms of reduced sortie rates, pilot risks and support manpower is easy to appreciate.

It is not the great breakthrough, but rather the cumulative, synergistic effect of some 40-odd innovations which make the radical improvement. Each of the innovations, taken by itself, would produce little or no improvement. This finding is of fundamental importance. It implies that it takes a decade or more for enough of the inventions to "collect" to the point where one can show the feasibility of a radically improved design. It then takes a substantial number (typically 20 to 30 percent) of specific additional innovations to make practical the radically improved design. (For Bullpup, this was 46 percent.)

Finally, and perhaps my bias is showing through, we can see almost no source other than technology for significant improvement in the effectiveness/cost ratio (in the specified tactical role) of the Bullpup over the unguided bombs which it supersedes.

I have used our early study of the Bullpup as an example to illustrate both the method of analysis and the inferences one can draw from this type of analysis. Concurrently with the Bullpup study, we expanded our program through the use of a contractor (Arthur D. Little). Using in-house teams, we have expanded it again, and it now has a name—Project Hindsight, with Colonel Raymond S. Isenson as Director. We have over 400 fully-documented RXD events in our files covering the following weapons systems besides Bullpup:

- Mk 46 Mod 0 Homing Torpedo.
- 105mm Howitzer.
- Hound Dog Missile.
- Polaris Missile.
- Sergeant Missile.
- Lance Missile.
- C-141 Aircraft.
- SPS-48 Radar.

We have found that it takes 30 to 60 man-months to analyze a typical system at the current level of detail —about 100 events.

In addition, we have active teams working on the following:

- Nuclear Warheads.
- Navigation Satellite.
- Minuteman II Missile.
- FADAC Artillery Computer.
- Mk 46 Mod 1 Homing Torpedo.
- Mk 56 and 57 Mines.
- 152mm Warhead.

When one examines the results of the current data bank, which as I have noted is already 10 times larger than the Bullpup case, it is remarkable how the inferences made from the Bullpup study are substantiated.

Simply counting the numbers of events, we find that 50 to 150 are needed to make the quantum jump in systems capability. Nearly 80 percent of the events are funded by DOD dollars and some 90 percent had as their motivating target a Government need, predominantly military. Research events are down to only two or three percent, but several of them are very important. A substantial number of events, about 20 to 30 percent, occur after the system contract has been let. The percentage of events for in-house Government (34 percent), universities (11 percent) and industry (55 percent) is surprisingly close to the recent DOD funding pattern for applied research which, for 1964-66, was reported to the National Science Foundation as 33 percent, 13 percent and 54 percent, respectively. (We do not have any simple way to determine earlier funding patterns, but we believe they change quite slowly with time).

Once again, we find the powerful selective stimulus of need as the motivator of almost all events. Again, we find that ready funding, either locally available or quickly available by one phone call to a Government officer (when there is an already established funding or contractual basis), occurs in a large percent of the cases. We are not sure whether good ideas attract "good" (that is, flexible) money, or if innovative organizations just "happen" to always have such money. Either way, there is simply no doubt about what is needed. Available technology money simply must be spread all over the place in little pockets near the need. It is not the ivory towers which need flexible money the most, it is rather the organizations heavily involved in real problems—particularly in the early stages of development of new systems. Fortunately, there is no reason today why this decentralized decision making should not be compatible with centralized coordination. With the new digital management information system for on-going work (the Research and Technology Resumé) now in operation in DOD and NASA and soon (hopefully) throughout the Government, it will be easy to decentralize

authority to initiate research and technology and still have at all levels an up-to-date knowledge of the national program and the means to assure coordination.

Some events are unusually important in their consequences. One single research event—the transistor—followed by the cornucipia of new solid state electronic devices which flowed from it, so to speak, has had a significant impact at least a hundred times more frequently than any other event. Research in signal processing and information theory has also had an enormous impact. New engines—invariably under development for years before they are found in an important application—set the pace for aircraft and missiles development more than any other technical area, except solid state electronics. To be properly interpreted, the Hindsight events will have to be weighed by some means—at least by frequency of use.

Finally, we ask, "What has been the pay-off of the total DOD investment in research and technology?" We can estimate this by noting that in some cases the increase in effectiveness/cost can be determined with considerable accuracy (for such calculations). For example: One of the systems studied was the SPS-48, a modern, 3-D surveillance and acquisition radar. We have demonstrated that much of the critical scientific and technological knowledge required to achieve this radar was not present in 1950 or even in 1960. The radar could not have been built much earlier than it was. Now, we must assume that the planned inventory purchase of the SPS-48's is just adequate to meet the current fleet surveillance radar requirements. With this assumption one can then determine how many of the best World War II technology radars would be required to replace a single SPS-48 in today's fleet defense environment. Our calculation, based upon a "gedanken design" of an improved SP radar and normalizing on target detection capability, reveals that 40 of the best possible World War II radars distributed geographically over the coverage area could barely match the performance of one SPS-48. This also means that 39 additional ships and 1,000 sailors to man these ships also would be required for each SPS-48 replacement. Multiply these figures by the number of SPS-48's required for the fleet and a real measure of the return on investment in research is apparent. We calculate that it would cost at least $15 billion more to achieve current capability without new science and technology and operate it for just one year . . . .

Summarizing: First, we believe we will be able to demonstrate that, properly managed, the value of the returns from the Government investment in research and technology outweighs by orders of magnitude the investment itself. Second, the key to proper management appears to be: Make the necessary financial and other resources easily and quickly available to the scientists and engineers who are closely coupled to the real technical problems of society.

Address by Mr. Frank Thomas, Asst. Dir., Nuclear Weapons, Office of the Director, Defense Research and Engineering, at the National Seminar of the National Classification Management Society, Los Angeles, Calif., July 13, 1966.

Classification and Technical Breakthroughs

I have selected my topic because I consider that the classification of new technology can have a strong effect, a feed-back on the general advancement of technology—and this relationship is not always recognized. As I have reviewed my talk, I discovered that perhaps most of what I will say today will be to tell you some of the difficulties in arriving at a proper classification for new technology. I hope I will be able to provide some new perspective to make the job of classification a little easier and perhaps a little more effective.

Within the Office of the Secretary of Defense there is a great deal of emphasis placed in "quantifying" the information required to make any decision. The first step in any major decision process is usually to quantify or place numerical values on all parameters in which this is possible and reserve for judgment only those items which cannot be so quantified. In trying to apply that rationale to the subject under discussion, I discovered very little that can be so quantified. We can examine past experience and, with reservations, project this experience into the future. But there are few positive statements that one can make with confidence.

Technological progress depends upon the creativity of individuals. And the creative process is a delicate one. Except on a statistical basis, it is nearly impossible to predict how or under what conditions new technology will be developed, when it will be developed, or even if it will be developed at all. I will discuss some of these statistical results and projections acquired by DOD later. But we know that the creative process does depend heavily upon an individual being able to acquire, examine, question and evaluate all new and pertinent information, and classification can have a major impact on the accessibility of this information.

Before discussing the development of new technology in any detail, I would like to make a point on the purpose of classification. First, try to consider and to outline the national objectives or national goals in the broadest possible terms. This can and has been done in a number of different ways, by political groups and politicians, Presidential advisory committees, philosophers and others. But for purposes of illustration let me examine briefly the national goals as outlined in the Preamble to the Constitution. If you will permit me a certain editorial license these goals are:

Goal 1. Form a more perfect union.

Goal 2. Establish justice.

Goal 3. Insure domestic tranquility.

Goal 4. Provide for the common defense.

Goal 5. Promote the general welfare.

Goal 6. Secure liberty.

If one accepts that the national goal is (in our technical jargon) to optimize or maximize these six individual goals, then it simply cannot be done. Assume for a moment that we could quantify these goals and remove the largely unknowable factors of complex human behavior. Even then, we could not simultaneously maximize all six goals. We could not maximize any two goals. Even with our simplifying assumption, mathematically we would be able to maximize only one of the parameters or one of the goals for any given situation or set of input conditions. As an example it is impossible to simultaneously achieve, say, maximum jus-

tice (Goal 2) and maximum defense (Goal 4). We must either select only one or we must achieve a balance between them. The President has established a group to examine our selective service laws in order to achieve a better balance between these two goals. The requirements of DOD cannot be met while providing absolute fairness or justice to all draftees, or potential draftees, or citizens in general. Inequalities are inevitable. The group will try to achieve the proper balance between defense and justice which will necessarily be less than optimum for each.

The framers of the Constitution, of course, realized the necessity of arriving at a balance between possibly conflicting national goals. A great deal of the Federalist Papers written by Madison, Hamilton and Jay was devoted to this subject. As an example, from the Federalist Papers, Madison states: "A wise nation . . . whilst it does not rashly preclude itself from any resource which may become essential to its safety, will exert all its prudence in diminishing both the necessity and the danger of resorting to one which may be inauspicious to its liberties." Thus Madison, in this case, tries to give some guidelines for establishing a balance between defense (Goal 4) and liberty (Goal 6).

A few years earlier, the economist, Adam Smith, observed that, "defense is of much more importance than opulence," thus stating in rather strong terms that defense is all important.

The point I would wish to make from this rather long digression is this: In the broadest sense any policy instituted by the Government, including the classification policy, cannot consider only a single national goal. Unless we are willing to forego all goals except one, the policy must consider the other goals and make at least some attempt to resolve conflict between competing goals.

The rest of my discussion will deal primarily with the cause and effect of technological development, methods to enhance defense, and comments on achieving a balance between defense (Goal 4) and general welfare (Goal 5).

Under present world conditions, DOD must see to it that the United States is in the forefront of science and technology, to protect the security of the United States against technological surprise, and to avoid obsolescence. Our defense must not be outflanked by a new scientific advance which is not part of our own arsenal.

In assuring that we are in the forefront, it is necessary to consider the interdependence of current technology —the fact that any modern technology, particularly one associated with complex weapon, space or nuclear systems, benefits from, and indeed requires, technological input from diverse sources and fields.

Early in 1964 a task group within the Office of the Director, Defense Research and Engineering, started to attack the problem of trying to assess the importance and the value of research and technology to defense and to see if there was a favored way to produce high pay-off, a favored way to achieve the proper environment. In order to avoid the natural bias of an inventor toward his most recent invention, the group decided to focus on an examination of past accomplishments rather than the prediction of future ones. It takes five to 10 years for discoveries or inventions to be applied to the defense inventory and, thus, have an unbiased assessment of their utility. The group wanted to be certain that the accomplishments that they had focused on had a clearly identifiable use. The objective of the study, called Project Hindsight, was to discover circumstances which DOD could manipulate or control, and which favor the initiation, execution and utilization of research and development program, i.e., find what techniques or methods have been successful in the past, on the average, and which had been unsuccessful, and to make at least statistical predictions concerning future development. For each weapon system the group asked:

- What recent scientific knowledge or new technology is important to the increasing of the performance or reducing of the cost?
- Where was the work done?
- A question I will examine in more detail—What motivated the creators?
- How was the research initially financed?

In nearly all cases, technological advancement occurred only when these three elements were present:

- An explicitly understood need, goal, or mission.
- A source of ideas, typically a pool of information, and experience and insight in the minds of the people who could apply it.
- Resources, usually facilities, materials, money, or trained men.

The results of the study to date demonstrate the interdependence of the technologies required for modern weapon systems. Technological breakthroughs, single quantum jumps, as one might suspect, are rare. They are the kind for which Nobel Prizes are won. Such breakthroughs might include the discovery of nuclear fission, the transistor and the maser. To go from the very basic breakthroughs, however, to a piece of hardware of significance to national defense and security is a long process involving hundreds of less spectacular and smaller steps in technology. The study showed that perhaps 50 to 150 of these smaller steps are needed to make the quantum jump in system capability. A number of these steps are made by organizations and research personnel directly working on a particular project. Some of these are in the nature of "scheduled inventions," advances originated and motivated by the desire to find a better way to solve a pressing problem for the project. But a significant number of these steps had their origin with persons remote in space, and perhaps in time, from the groups working on the specific system.

A considerable number of these steps originated in research institutions or universities which provided a new idea, a new concept, or a new analytical method which was readily adaptable to the problem at hand. Throughout the development process, free communication between technical communities and between the individual scientists and engineers is important. A solution cannot be utilized unless the person who has the problem is made aware of the solution or at least the existence of the solution. A case in point occurred in Germany during World War II. The German submarines were being badly defeated because they were unable to counter the British radar. The German Air Force captured some British radar equipment but, because of overzealous protection of the information, the German submarine command did not learn of this for six months. Undoubtedly, the war was significantly affected by this one instance of short-sightedness and over-restriction.

Another point brought out in

Project Hindsight which may bear on the topic under discussion is that of organizational flexibility. Informal personal communications are an important factor in developing new technology. Very often, the first step in approaching a new problem is to get on the telephone with a colleague who is or was working on a related problem. The colleague may be in the next building or across the country. But anything that interferes with this informal process impedes development. Nearly all technological advancement has occurred in flexible organizations in which strict lines of authority do not operate and in which there is relatively uninhibited communication between the technical personnel at all levels. Apparently, in such an organization a new idea can be more easily received and evaluated on its merits, and the inventor is highly motivated to bring forth new and unique ideas which aid in the solution of the problem being addressed by his group. By and large, new technology does not come from strict and authoritarian organizations. New technology cannot be tightly restricted or compartmentalized.

The point to be made is that any classification or other restriction on the free flow of technical information will necessarily impede the development process. This is true both within a group and between groups. The solution to a technical problem may come from a number of sources. In one case examined in Project Hindsight, a mathematical paper written many years earlier suggested a new solution. In other cases it may be from another individual or group working on a related problem or from a group working in a technology quite remote. We cannot predict solutions to technical problems. We cannot predict the origin of the solutions. And often we cannot even ask the proper questions or formulate the problem. But we can predict that the highest probability of achieving a technological advance will come under conditions in which people are highly motivated and have free access to all available information and have free and uninhibited communication within their group and with other groups.

I am not suggesting that the classification barriers which we have found necessary in this country should be lowered. Perhaps the barriers should be raised. But it should be clearly recognized by all concerned that barriers of any kind will necessarily impede and slow down the development process. Solutions will be missed, inventions re-invented, and less satisfactory means accepted. This is true in the development of hardware for defense. And it is true in the development of hardware which benefits the economy as a whole. So with regard to classification, I suggest that two judgments are required. First, how much will the classification or restriction of a particular piece of new technology restrict the development of other defense systems? The balance is one of impeding your own development as well as that of your potential or actual enemies or competitors. Second, how much will the classification or restriction of a particular piece of new technology restrict the development of the general economy? The balance here bears directly on my earlier remarks about national goals. There will necessarily be a conflict between what's best for defense and what's best for the general welfare or the general economy. Classification of particular technology may be best for our defense posture (relative to other nations) but may be bad for the general economy.

I believe that within this country we have an automatic safety valve. This lies in the high mobility of the technical community. Even when specific design information is highly restricted, the techniques and methods used to develop that design become diffused throughout the technical community in a relatively short time by a reasonably efficient method. The technical people move, change jobs and adapt the new method to solve their new problem. If a new large group is established in this country to solve some problem or design some sophisticated device, you will generally find that the group will contain individuals who have had experience at most of the major laboratories and industrial installations in the country. To some degree, the collective past experience of all these installations can be focused on the new problem. When a technical man quits his job and moves on, we consider it a loss. But to some extent he is a missionary carrying with him the techniques and knowledge he has acquired. This diffusion process is noticeably lacking in totalitarian societies, and I believe their technology is weaker because of it.

We have one other automatic feedback mechanism. A great deal of the research and technology in this country is done by commercial organizations whose primary goal is to achieve a profit for the investors. In general, if a particular new technology will perform a useful function that could not be performed before (or will do it more cheaply or more effectively than it could be done before) then it will aid the nation as a whole. In either case, there is generally an economic incentive to utilize the technology in the general economy, a profit to be made in this utilization. Management of a commercial organization will usually realize this potential and will take some action to see that the new technology, or at least portions of the new technology, are made available for this purpose. I expect that this mechanism is a far more efficient one than negotiating values between Government bureaus as required ir many nations.

I have discussed the rate of tech nical development as being a signifi cant factor in today's national de fense. Today a nation cannot depen primarily on a depth of defense i space but is clearly compelled to de velop its depth of defense in time a well. Technology is indeed moving a a rapid rate and this is a relativel new factor in defense. If you wi permit me to go back 600 years, can give you an example that th was not always so. The English i the course of their Welsh and Scottis wars developed a new instrument warfare, the long bow. It clearly ou ranged and outmatched the crossb which was in general use on the co tinent at that time. In the course these wars the English had also veloped the tactics which made go use of their new technology. In 13 King Edward with an English ar of 20,000 met a French army 40,000 at Crecy in France. The Frer army was vastly superior in moun men and armor, and in continen warfare this was about all t counted. With the longbow, howev the English were able to engage enemy at a great distance, and French, under this rain of arro were unable to assemble any reas able charge of their armored knig The French army was practic annihilated. Sixty-nine years later

English again met the French at Agincourt. Again the English had the longbow and the proper tactics and the French did not. Again, the French knights were virtually annihilated. In 69 years the French had neither copied nor countered the new English weapon. It required another 200 years for the final defeat of the armored knight in the person of Don Quixote, under the pen of Cervantes.

I came upon another example a few months ago while touring El Morro Castle in San Juan, Puerto Rico. King Charles of Spain authorized the construction of the castle in 1523. Some 20 years were spent in raising funds to build the castle, another 10 or 15 years in designing it, so that the first fortification was not completed until 50 years after it had been authorized. I have heard comments about the long time sometimes required today to get military construction authorization and appropriation but I think no one can argue that the pace of technology has increased at least a little since El Morro was built. . . .

. . . Note that the segments of the economy increasing most rapidly are those in which the most technical advancement is occurring — electronics, communications, chemicals. Segments declining are those in which there is almost no technological advancement, such as wooden containers.

Time scales will be further shortened. This time factor in itself introduces a new facet in defense planning. It suggests that a nation might assure its security simply by advancing more rapidly than all potential enemies. It is a facet that renders opposing forces obsolete by the time they are deployed. The opposition is outflanked in time, rather than in space. This is clearly not the case in all fields today, but it is a strong factor in many fields. This time factor is more important during an all-out war than it is at a time like the present. During an all-out war the cycle time between offense and defense is shortened. There is rather complete knowledge of the weapons being used by the opposition and a strong incentive to develop techniques to counter these new weapons.

In reviewing the classification problem under wartime conditions, I would like to quote a paragraph from the report of the Office of Scientific Research and Development (OSRD), written in 1946 by the scientists and engineers who were engaged in this race during World War II. The report states that "In the midst of war, it is clear that the best security lies in speed, in achievement, rather than in secrecy. That this secrecy can defeat its own purpose is shown by the frequency with which enemy scientists independently discovered techniques zealously guarded by us. Our secrecy merely slowed our own production and decreased our time advantage." I should point out that the fact of independent discovery also operates in peacetime. The history of technology is full of examples of near simultaneous discovery by two independent parties. This process is doubtless still continuing in certain areas. Again referring to wartime conditions, the OSRD report states that, ". . . Science in its military applications as well as in the basic form, must be a 'free science' in order to be strong. . . . Contributing parties must be adequately informed about the tactical and technical problems. In spite of this obvious fact, there was far too much indiscriminate, blind classification of military information, scientific discoveries, technical equipment, and correspondence. Not only were our civilian scientists given too little access to military planning but they were also kept in mutual ignorance of scientific advances in cognate fields. Discoveries made in radar should have received much wider dissemination to those working in communications, television, underwater sound, and other fields. That these discoveries were not so distributed is a sad reflection on the scientists themselves who were temporarily forgetful of the very essence of creative thinking—freedom of publication. No one is suggesting unrestricted publication in the public journals, but surely there could have been a series of classified journals, available to all cleared scientists, which would have broken down artificial and highly injurious barriers. The writer has personal knowledge of many instances where greater restricted distribution of basic scientific and technological data would have profoundly increased our scientific strength." Thus, at least in the mind of some World War II scientists, over-restriction of data did have an adverse result.

A sustained high rate of growth also enhances national security by promoting the productive and economic growth of the country. Thomas Paine once said: "War involves in its progress such a train of unforeseen and unsupposed circumstances that no human wisdom can calculate the end. It has but one thing certain, and that is to increase taxes." However, in the past year the United States has simultaneously made a large increase in our efforts in Southeast Asia, has cut taxes, and has just established a record for revenue in a single year. Perhaps our dramatic rate of growth has contradicted Tom Paine.

National security is indeed related to overall national strength. And continued growth in overall national strength is heavily dependent on continued rapid advances in technology, better transportation, better communication, a technology that permits increased output for every person in the labor force and from every bit of our natural resources expended. This continued technological growth requires a free interchange of technical information between scientists and engineers.

In conclusion then I would like to summarize the points I have made as follows:

- An effective classification policy must include consideration of the effect that possible restrictions of information will have on other technical developments. Such restrictions will necessarily have some adverse effect on the development of your own systems for national defense and national security.
- Such restrictions will also necessarily have an adverse effect on the growth of the economy as a whole and national security is not unrelated to this growth.
- The requirements for national defense in as absolute sense are not ends unto themselves but must be balanced against other necessarily competing requirements such as justice, liberty and general warfare.

I hope I have provided you with some added perspective. I have tried not to argue for or against any particular classification actions, but I have tried to point out that future technological growth in defense and in non-defense industries cannot be ignored in arriving at classification decisions.

Can the Aerospace Industry Meet Reliability Requirements for Manned Space Flight?

by

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My approach to the question of whether the aerospace industry can meet reliability requirements for manned space flight will be to trace very briefly the evolution of aerospace quality control from the World War II techniques of brute force and super-saturation through the various advances of today's relatively sophisticated system. I will then outline in general terms my assessments of the changes which must come about if we are to provide the assurance that aerospace equipment and military materiel will perform their intended function for the specified mission.

Prior to World War II, Government contracts had no firm requirement for contractors to employ systematic quality control. The Government automatically re-inspected all products 100 percent! The staggering volume of wartime production soon made this completely impossible. Thus, the Government was forced to a spot-checking technique which lacked both depth and thoroughness. The weaknesses of this approach certainly cost lives and dollars, and our successes were achieved only by overwhelming volume.

In the years prior to and during the Korean buildup, the need for a more sophisticated system became apparent. High performance jet aircraft were designed for the delivery of atomic weapons, and reliability requirements became more imperative. It was in this environment that the Air Force developed its first real quality control system as outlined in Specification MIL–Q–5923 and subsequent revisions. This system recognized that quality hardware could only be produced by the contractor's systematic control of quality. The specification, therefore, generally outlined requirements for a contractor's system formally incorporating tool and guage calibration, material review boards, certification of materials and special processes, nondestructive testing, vendor quality reviews, sampling plans, etc.

Within the past dozen years the aerospace industry and, in fact, the entire nation faced a higher order of complexity with even more critical demands for reliability. The urgency of the requirements called for a variety of new management techniques, including the concept of concurrency wherein development, test, production and installation could, and frequently did, overlap each other. In this environment the three Military Services agreed on Specification MIL–Q–9858 (and later 9858A) which placed substantially more responsibility on the contractor, requiring that he control subcontractors, certify operating specialists and vendors, control non-conforming supplies, maintain quality cost data, etc. Scrutiny of this system by various Government quality representatives varied from one installation to the next, soon developing the need for more consistent formal application by the Government. To meet this need the Air Force developed the Contract Management Quality Assurance Program augmented by a uniform Continuous Audit Program. These procedures provided increased flexibility for verifying the contractor's system to the depth required.

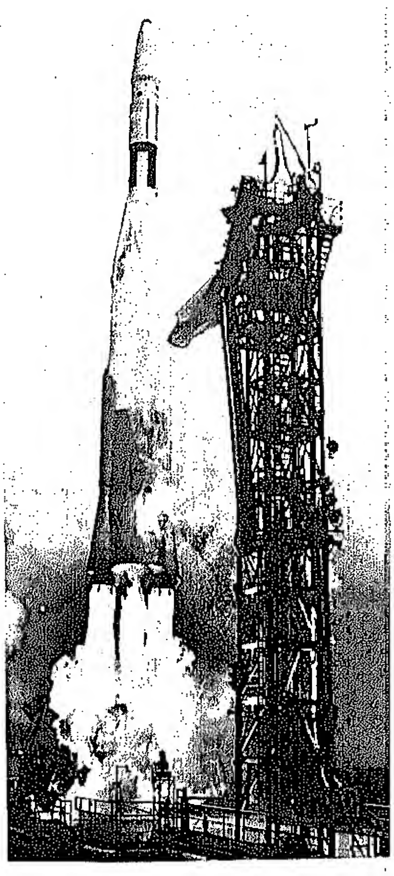
The news from Cape Kennedy and Vandenberg remind us from time to time that quality assurance has not adequately kept pace with the scientific and technological breakthroughs which place us today in the era of space flight, both manned and unmanned. Despite the inadequacies of today's system, however, the record is surprisingly good!

During 1965, out of 64 launches conducted by the Air Force's Space Systems Division, for example, 61 were successful. In 1964, the totals were equally impressive—66 successes out of the 69 National Aeronautics and Space Administration and Defense Department launches performed by the Air Force System Command's Space Systems Division.

Over the full two-year period, that's 127 for 133—or better than 95 percent success on the launch pad.

Included in these totals are some phenomenal achievements. The Thor as a space booster, for instance, had 39 successes in CY 1964, 29 in CY 1965, and entered the new year with a running total of 70 consecutive successful launches. Atlas was 19 for 19 in 1964, and 15 for 17 in 1965. And in more recent months, all ten Gemini launch vehicles have performed flawlessly.

A word, however, about our failures. All satisfactory launches do not connote complete success. Unless we achieve complete payload performance



Air Force Atlas Agena.

as planned, our mission is not complete. Despite sophisticated telemetry, there are cases where unmanned space vehicles have failed to perform as planned and we simply do not know why.

In such a case, corrective action can be a baffling challenge. Solutions may be sought through design analysis, simulated operation in the laboratory, or even replacement of the suspicious unit(s) with others where previous experience has been more successful. There is no uniform approach especially in view of tight program schedules.

A review of quality assurance techniques applied to date points out the fact that almost the entire effort is expanded in the search for non-quality, i.e., the detection of defects. Where our detection fails us, we see, at the worst, catastrophic failure of extremely costly hardware, not to mention casualties and, at the best, costly program delay. A truism that has survived, though not without challenge, is that we cannot inspect quality into hardware.

Even if we overlook the possibility of catastrophic failure, the cost of program delay which defective hardware can produce staggers the imagination. For example, it is generally recognized that a manned flight to Mars will involve an expenditure of approximately $50 billion over a 15-year period, or $10 million per day. All of this effort would culminate in the flight of less than 10 spacecraft from Earth to Mars. Thus, the national investment in each would represent a minimum of $5 billion—an unthinkable amount to be lost due to poor quality that will result in unreliability.

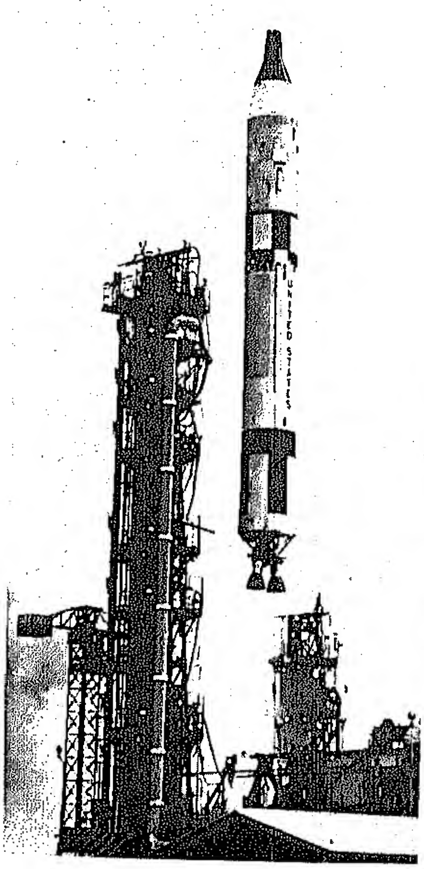
The manned Mars mission would be further complicated by the fact that launch windows, of approximately 45 days duration, occur only once each two years. Thus, the launch vehicles must not only be launched reliably, but they must also be launched in a timely manner. The cost, at $10 million a day, of unreliability in timeliness in meeting the launch window is as great as the investment in the vehicle itself.

Let us consider for a moment the statistics of reliability. Consider a modest space vehicle composed of eight major components, i.e., ground launch system, propulsion, guidance control, power, supplies, etc. All are extremely complex, some more than others. To oversimplify, let's say that each of these major components has six subassemblies. We must assume that each subassembly must perform properly to assure system-reliable performance. If each of these subassemblies has a reliability of 99 percent, the total system reliability will be only slightly more than 60 percent.

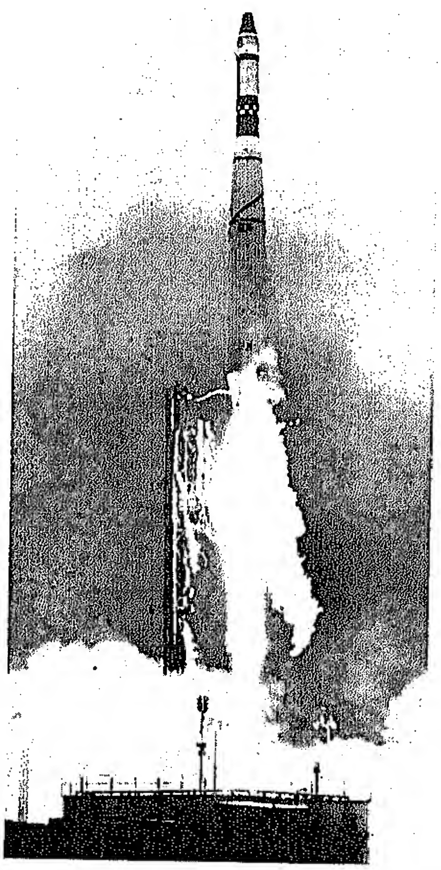
Fifteen years ago an analysis of these figures proved to many that such a system, like the bumblebee, could not fly. Yet it has been done. We know it can be done with even more complex systems. The successful Gemini program provides the most recent and certainly the most dramatic evidence. If we are to overcome the statistics of reliability, it is imperative that we provide an atmosphere, an environment where a relative reliability goal of 100 percent can be approached.

The pursuit of this goal during recent years has produced techniques which permit reasonably good predictions of system reliability through design analysis. These techniques enable us to pinpoint high failure components which, in turn, generate design changes such as redundancy, longer life parts, more resistant materials and self-reorganizing systems. Use of these techniques can be effective in the solution of our reliability problems. The tri-Service MIL-STD-785, "Reliability Program Requirements," stipulates the use of these techniques and is being applied to the development of major weapon systems and space vehicles.

Knowing that many of you may be driving new model automobiles, I hesitate to point to the automotive industry. However, the major motor companies are now guaranteeing material and workmanship for 24 months or 24,000 miles. As with all guarantees, you may find some small print in the contract. Nevertheless, as the cost of making good these guarantees is charged back to the manufacturing operation, we see incentives to produce reliable hardware that cannot be ignored. A quality control manager from one of the major motor companies said to me, "The dollar is a universal document! Even a vice president can understand it."



Gemini Titan II.



Air Force Thor Agena.

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REWSON
A Concept Vital to Fleet Readiness

by
Capt. Dick G. Wilson, USN
Office of Chief of Naval Material

The formal establishment of REWSON began with the acknowledgement by the Chief, Bureau of Naval Weapons (BuWeps) in 1964, of a need for a central coordination authority. The need was for a coordinated effort in certain related areas which had not yet been acknowledged as being of prime importance in the naval planner's mind, as had the more obvious need for ships, submarines and aircraft. The related areas addressed are combined in the acronym REWSON, standing for Reconnaissance, Electronic Warfare, Special Operations and Naval Intelligence Processing Systems. Recognizing the vital role to be played by a REWSON concept, in 1964 an office was established in BuWeps and a Project Management Office (PM-7) in the Office of the Chief of Naval Material. This was followed closely by initiation of a REWSON office in the Office of the Chief of Naval Operations (CNO).

The functions of REWSON can be likened generally to the functions of the sensory or nerve system of the body. REWSON systems are the nerve fibers which make weapon system platforms into effective individual operating units as well as effective parts of a coordinated fleet. The REWSON concept acknowledges the need for this integrating fiber and fulfills this need by working intimately with the fleet environment from a physical and enemy-threat point of view.

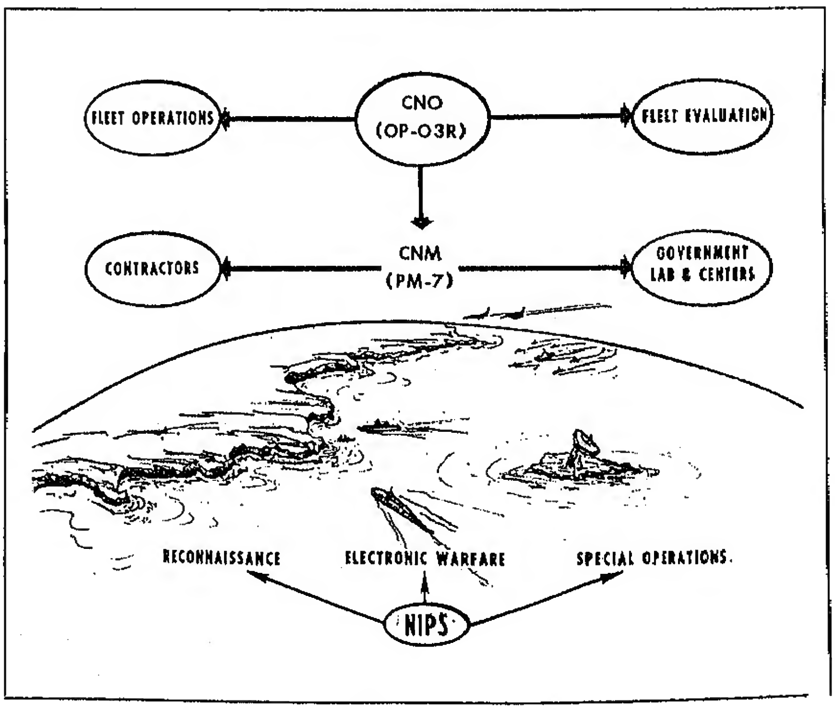
The reconnaissance sensors of ships, submarines, planes, satellites and shore stations must have adequate capabilities, and their outputs must be correlated and displayed in such a manner as to permit timely analysis and reaction. Only when navigational grid systems, resolutions, accuracies, data rates, time of intercept, etc., are known and compatible throughout will the tactical picture have meaning to the tactical commander. And only when such information is accessible in a timely manner will it be operationally valuable. Therefore, information, once gathered by tactical reconnaissance platforms, must be rapidly processed and disseminated. A system of naval intelligence processing and transmission (NIPS) is required to do this.

The fleet commander now has quickly obtained his own tactical reconnaissance data for the specific geographic area of concern; he has processed and integrated it with the data base of strategic intelligence; and he is now ready for operational planning. He is able to plan his resources to fit the geographic and enemy environment which he knows exists for day-to-day operations. He is able to put together a total picture and, equally important, the picture is current.

The element of surprise must be exploited to the maximum extent possible for each sortie in order to maximize the target kill probability. To accomplish this, the fleet commander must utilize his electronic warfare capability by identifying and locating threats and targets. He must also coordinate his electronic warfare systems to nullify, confuse and deceive the enemy defenses. This enhances survivability and, thereby, increases the cost effectiveness of a given mission.

Special operations encompass the other terms of REWSON, since special operations are often planned and executed to reconnoiter, to gather specific intelligence information, or to execute electronic warfare or other special missions. Special operations may utilize the special forces of the amphibious-type commanders, or they may utilize—in a special way—the more conventional forces of other type commanders, i.e., aircraft carriers, submarines, etc.

Obviously, the entire REWSON effort is complex since not only does the enemy use the entire electromagnetic spectrum, but so do all platforms of our forces. The effective



realization of a REWSON capability is necessarily the result of many years of intelligence gathering and analysis, of systems planning and integration, and of tactical training and doctrine development. The sum of these spells fleet readiness. This can only be accomplished after years of coordinated effort. Imagine, if you can, in this world of ever expanding technology, what the 1970's and 1980's hold for our Navy. Then imagine what it would be like if there were no organization which acknowledged the complexity of coordinating REWSON efforts.

The REWSON organization since its inception formally acknowledged that REWSON requirements must be compatible from ship to submarine to aircraft to satellite. It acknowledged that development, procurement, test and evaluation, training and doctrine development cannot live in a vacuum, and that the integrating fiber of the fleet nerves must be planned in all commands at all levels from concept to fleet capability. The operating Navy and the material Navy both need an organization capable of early recognition of REWSON requirements and of rapid development of the equipment, system, or tactic to fulfill these requirements. Had the need for this REWSON organization not been recognized and had we failed to activate such an organization, the imponderables of intelligence and security, of indecision and of no action might have seriously impaired the Navy's role in national defense. However, with the recognition of the vital role to be played by the REWSON organization, great strides have been made and plans are well under way for adapting REWSON to the new systems commands.

In addition, there has been a recognition of the need for other REWSON resources. The several Navy laboratories and centers are being tasked and organized to be responsive to the fleet requirements. Quick Reaction Capability procedures for REWSON equipments and systems are being finalized at the Secretarial and Chief of Naval Operations levels, and will provide definitive guidance, via the CNO Quick Reaction Capability Board, to the Commander, Naval Material Command, for five-day contracts in the most urgent instances. The resources of industry are being marshalled to provide both analytical and hardware assistance in meeting the demands of REWSON requirements of the fleet.

To summarize, the REWSON concept has caused the entire Navy to recognize the need for a coordinated systems approach in this area. Commands have responded to this by organizing to accommodate this need. The operating and material Navy has not only led the way at the headquarters level but has also tasked the field facilities, laboratories and contractors to be responsive to the concept and to the need for quick performance.

The requirement for a REWSON organization has always existed even though formal recognition of this need for integrated management is only two years old. Organizationally it is a newcomer, but it is healthy and strong, and has already made an invaluable contribution to the Vietnamese conflict. The future is even more promising as we provide for the REWSON requirements of the fleet by directing REWSON resources from a central office.

FY 1966 DSA Procurement up Due to S. E. Asia Buildup

Under the impact of the Southeast Asia military forces buildup, procurement for the Defense Supply Agency (DSA) during FY 1966 rose to $5.7 billion compared with a total procurement for the previous fiscal year of $3 billion.

The Defense Supply Agency purchases and distributes to the Military Services commonly used supplies including food, clothing and textiles, electronic parts, fuel and petroleum products, medical, chemical, industrial, construction and general supplies.

Civilian employment also increased during the past fiscal year, mainly the result of activation of additional Defense Contract Administration Services Regions (DCASR's) in the field between July 1 and the end of the calendar year.

Total DSA civilian employment at the end of FY 1966 was 52,425 full-time employees, as compared to 33,230 in the previous year. The number of military personnel during this period rose from 898 to 1,129. About 15,000 of the civilian and military personnel were added as a result of the DCASR activations.

With the completion of the DCAS consolidation during the fiscal year, DSA was administering a total of 225,000 contracts of the Army, Navy, Air Force, DSA, and the National Aeronautics and Space Administration through a network of 11 regions spanning the United States.

The number of supply requisitions processed rose to 19.4 million during the fiscal year, a jump from the 15.4 million figure of the previous year.

An innovation was the activation of the Red Ball Express, a speed-up logistics system which enables DSA to furnish at high speed desperately needed items of equipment being used in Vietnam. From inception of the express, on Dec. 7, 1965, to the end of the fiscal year, the system received 51,305 requisitions and supplied 49,005 for a 95.5 percent record.

In the overall handling of supplies by DSA, there was a system-wide increase amounting to 2,384,900 tons shipped in FY 1966 as compared to 1,575,300 tons in the previous fiscal year. During the same period, DSA received 2,567,200 tons in FY 1966 in comparison to a previous 1,404,000 tons.

Inventory value remained at $2 billion during the periods of comparison, while the number of items centrally managed dropped from 1.4 million in FY 1965 to 1.3 in the past fiscal year.

Procurement totals from all Defense Supply Agency centers rose during FY 1966. A comparative breakdown follows:

Activity	FY 1965 (millions)	FY 1966 (millions)
Defense Construction Supply Center	$ 171.1	$ 687.5
Defense Electronics Supply Center	134.7	223.0
Defense Fuel Supply Center	1,165.7	1,302.7
Defense General Supply Center	145.7	519.9
Defense Industrial Supply Center	117.0	323.6
Defense Personnel Support Center		
Clothing	317.2	1,175.6
Medical	121.7	225.5
Subsistence	839.4	1,222.0
SPUR (Special Purchases-Overseas Use)	18.9	41.9
Other	11.0	17.7

(*Continued from Page 3*)

systems analysis until we know at least what the initial alternatives are. Helping on that problem, I believe, is a major role for industry.

I might also note that it is in our mutual interest to approach the development of new systems in this way. We think it improves our chances of making the best choices and getting programs established on firm ground from the start. And it seems to me that you would certainly prefer to participate in programs which have the best chance of being successful and entering into substantial procurement.

A second way in which industry can contribute, to our mutual advantage, is by the application of the principles of systems analysis to the design of weapon systems and components. It is, of course, true that we are interested in accomplishing the necessary military tasks at the minimum cost, and I do not think that you, as citizens and taxpayers, would have it any other way. But I sense that there is considerable misunderstanding of our attention to cost. Too often our reluctance to recommend a so-called "best" system is interpreted as simply an effort to hold the budget down. Much of this impression, I believe, arises out of a confusion between "the best in the way of a single item of hardware" and "the best in the way of an overall force." Sometimes, the best overall force may be composed of a relatively small number of very capable units; other times, the best force may be composed of a rather larger number of units of lower individual capability. There is simply no rule-of-thumb that will always be right; you have to examine each case on its own merits.

When we compare alternative systems, we are interested in what we get for what we pay. It seems to me that you in industry should be in a unique position to determine which characteristics have an important effect on cost, to take a critical look at elements which add to the cost without a commensurate increase in effectiveness, and to suggest new approaches to a better balance between unit effectiveness and overall force effectiveness. I realize that many of you have value engineering activities, and I would not want to minimize their desirability nor their importance. Rather, I am suggesting that there are even greater possibilities in examining the relationship between cost and effectiveness in the conceptual stages of weapon development.

The third way in which I think industry can contribute to our use of systems analysis lies in the relationship between systems analysis and contracting. This is an area in which some progress has been made but the untapped potential seems to me be very large, provided that we work it out together.

In the past, without the benefi systems analysis techniques, weapon systems were selected marily on the basis of perform characteristics. For example, a l tic aircraft would be describe terms of range, payload, speed, so on, but without any specific

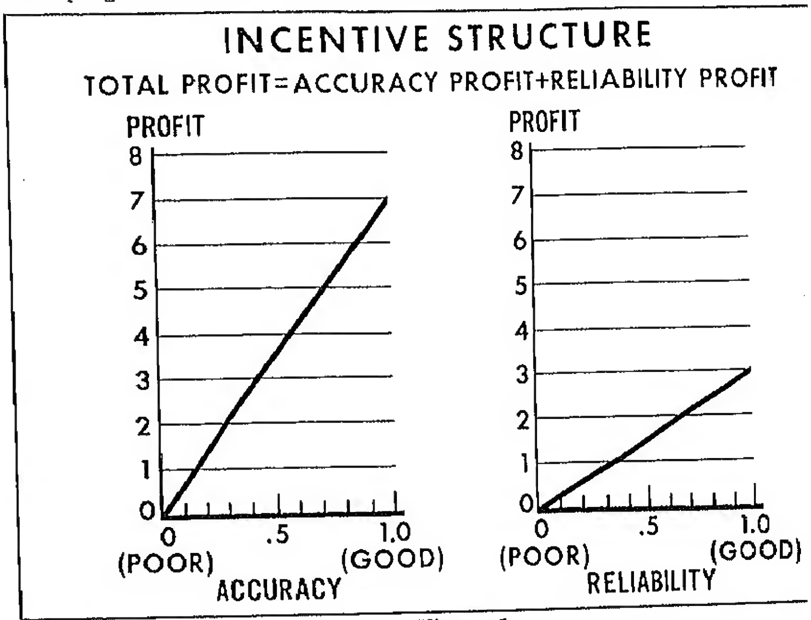


Figure 1.

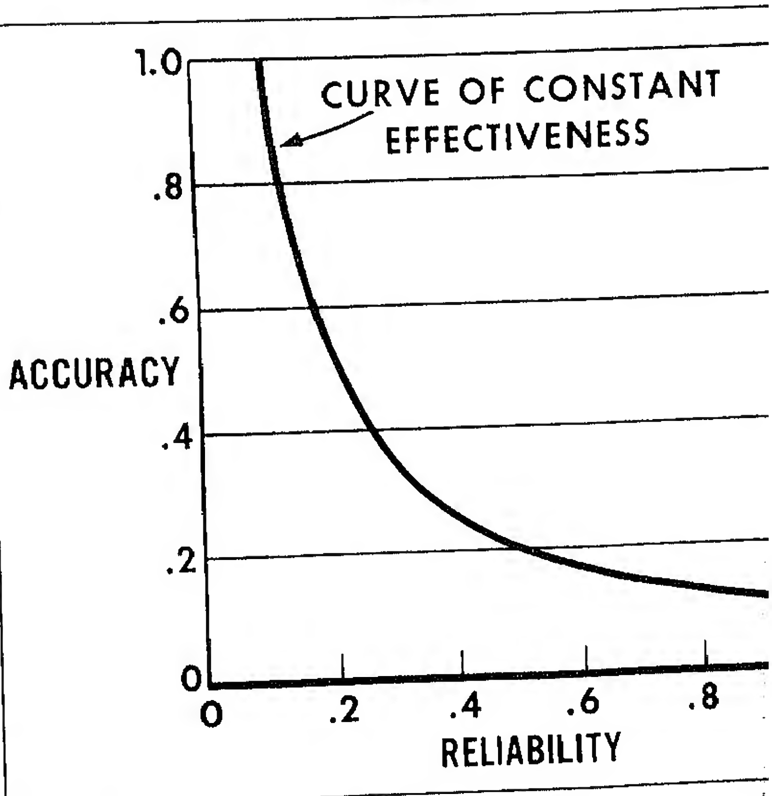


Figure 2.

way—by which I mean—are higher profits really tied to a more effective system? To answer that, let's look at how accuracy and reliability couple to determine effectiveness (Figure 2).

Here I have shown a plot of accuracy versus reliability, and have drawn a curve of constant effectiveness—by which I mean that any combination of accuracy and reliability which falls on this curve will result in the same percentage of missiles hitting their targets. Note that if the reliability is low, the accuracy has to be high (the upper left end of the curve)—and that if the accuracy is low, the reliability has to be high (the lower right end of the curve). The point is that, in this simplified example, the Government's real concern is not just accuracy, or just reliability, but how many missiles hit the target. Whether the given level of effectiveness is obtained by getting off a lot of missiles, only a few of which hit, or by getting off a few missiles, most of which hit, should be a matter of secondary concern. At least as a first approximation, one combination of accuracy and reliability anywhere along this curve should be as satisfactory to the Government as any other point.

Keeping the general shape of the curve in mind for the moment, let us return to the incentive structure I outlined before (Figure 3). On this graph I have combined the two incentives which I showed separately in the first graph. Here, within the parallelogram, there is a slewed coordinate system. The more nearly horizontal coordinates correspond to the various degrees of accuracy from zero to 1.0, while the more nearly vertical coordinates correspond to the various degrees of reliability from zero to 1.0. Thus, all the possible combinations of accuracy and reliability fall somewhere within this parallelogram. This is really nothing more than a graphical way of adding up the two separate incentives to determine the total profit.

Having established this slewed coordinate system, with accuracy running one way, and reliability running the other, I can plot on it the curve from the last figure, which shows the various combinations of accuracy and reliability which result in the given degree of effectiveness (Figure 4).

I think that this is an interesting result. Remember that because any one point along the curve results in the same effectiveness as any other, the Government should have no particular reason to prefer any one point over any other—nor should it be willing to pay any more for one point than for any other. Yet notice how great a spread in profits there could be, in spite of the fact that there is no corresponding spread in effectiveness.

But to show how perverse this contracting arrangement really could be (Figure 5), I have added a second curve of constant effectiveness—this one showing all the combinations of accuracy and reliability which would result in a missile just twice as effective as any falling on the first curve. (For any given reliability, the accuracy is twice as good, and vice versa.) I have also shown how much profit results from two particular missile designs. To emphasize the point, I have picked the two that represent the extreme case. One missile falls at the top of the first curve, and the contractor derives a profit of a little over seven units. The second missile falls at the bottom of the second curve, and the contractor derives a profit of only about four units, even though it is twice as effective as the first missile.

This sort of incentive structure is clearly undesirable. Although the idea of inducing the contractor to increase both accuracy and reliability, in this hypothetical example, is a good thing, we must go further than that and consider the relationship between the two. This can be done through systems analysis and, if the relationship between industry and the Government is to be mutually profitable, we must match the contracting incentives, not simply to a series of intermediate parameters, but to the job to be done.

Of course, this is more easily said than done. Just how rapidly we can, or should, move in this direction, and how far we should go, is unclear at this time. I have already noted the essentiality of some relatively unambiguous way of measuring the degree to which the product meets the criteria, and some of the criteria used in systems analyses are considerably more difficult to measure than are such classic parameters as gross weight or top speed. In addition, we would have to give careful consideration to the problem of "rule beating" —by which I mean taking care to avoid the possibility of being able to meet the letter of the guarantee without meeting the spirit of the systems analysis behind it.

In any event, I would like to make it absolutely clear that my purpose is not to announce a new contracting policy, but rather to stimulate some new thoughts on an old problem: how to get the most defense from the resources available to us. What I would like to see is not a precipitous and revolutionary change in contracting procedures, but rather a sober consideration of the alternatives open to

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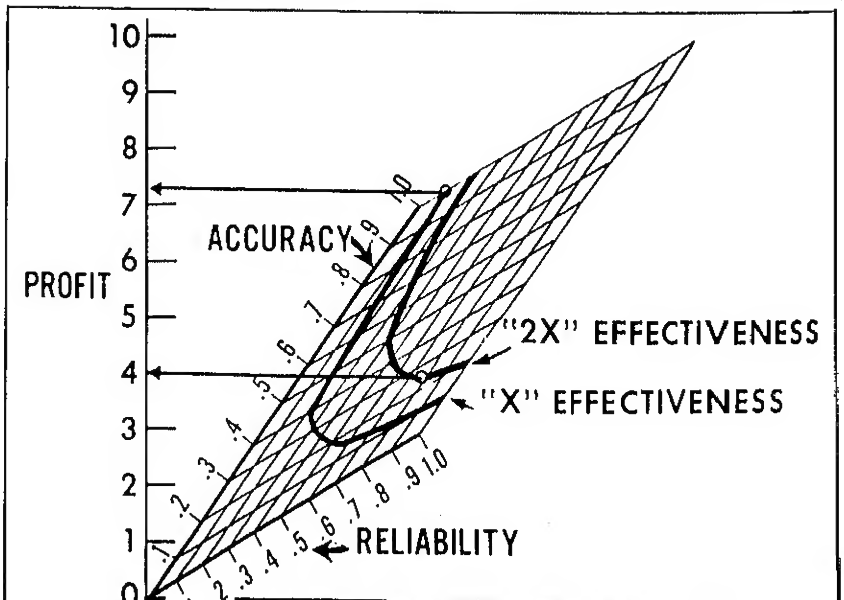

Figure 5.

R. I. P.

Reduction in Paperwork

by
Clyde Bothmer
Executive Secretary
Defense Industry Advisory Council

Some Defense contractors will breathe a sigh upon seeing the above acronym and conclude in despair that another "cult" is being introduced into their already complicated lives. READ ON! Nothing could be further from the truth.

At a Department of Defense/National Security Industrial Association Symposium in May 1965, the keynote speaker, Mr. Tom Morris, then with private industry, but before and since an Assistant Secretary of Defense, made the following statement:

> **"While this symposium is considering the technical information problem and the approaches to its solution, I recommend that it contribute new thinking, if possible, to non-technical data problems as well. I refer to the data requirements of management systems or programs, such as those concerned with Quality Assurance, Reliability, Maintainability, Value Engineering, Pert-Cost, Configuration Management, and the Integrated Logistic Concept."**

Subsequent Defense Department speakers at that same symposium pointed out that the newly-created DOD Council on Technical Data and Standardization, and the Office of Technical Data and Standardization Policy, under the Assistant Secretary of Defense (Installations and Logistics), were carefully tailored steps aimed at bringing order into the requirements levied on defense contractors for technical data.

The Defense Department has more recently focused attention on the "non-technical data problems" referred to by Mr. Morris. Assistant Secretary of Defense (Comptroller) Robert N. Anthony has created an Office of the Deputy Assistant Secretary (Management Systems Development) with important responsibilities in this area. The Comptroller's interest in management systems goes much beyond the need to assess the financial impact of Defense programs. To assure that Defense resources are used effectively and efficiently, actions are in process under Mr. George W. Bergquist, the Deputy Assistant Secretary for Management Systems Development, to attack reports proliferation problems with improvements in management systems design.

The direction of future collaboration to obtain relief for contractors from management systems implementation problems is being explored jointly by DOD representatives and a CODSIA (Council of Defense and Space Industry Associations) group. In addition, a special DOD group has completed a study which identified the management information needs of project managers. Other actions will be under way shortly.

Further, the Defense Industry Advisory Council (DIAC) (See *Defense Industry Bulletin*, April 1966) has devoted considerable attention to a report of the Aerospace Industries Association (AIA) dealing with Government management systems and data requirements incident thereto. Further work with AIA and other interested associations will be undertaken in this area by Defense. Deputy Secretary of Defense Cyrus R. Vance, in his role as Chairman of the DIAC, will continue to seek advice from the council as significant points are developed by this joint effort.

It is apparent, therefore, that paperwork problems in both the technical and management systems areas are under attack. It should also be pointed out that these are coordinated attacks, as they necessarily must be, since the line between technical and management systems data requirements is by no means a completely distinct one. But even with these complementary efforts, are all appropriate steps being taken to reduce to an absolute minimum the paperwork burden on defense contractors and subcontractors?

Assistant Secretary of Defense (Installations and Logistics) Paul R. Ignatius doesn't think so. In response to Congressional inquiries in this regard, he described some of the above points, but went on to say that "the task is a never-ending one." Accordingly, he has directed that further efforts be undertaken to assure "that we obtain no more data from contractors than is essential to carry out our responsibility for effective management of our procurement program."

In response to this direction a number of steps are being taken. For example, a subcommittee of the Armed Services Procurement Regulation Committee has been formed to examine contractual requirements and to do several case studies. Consideration is being given to asking a working group of the DIAC to help in this effort. The requirements for data levied by components of the vast contract administration field organization of the Defense Department are being examined in some detail.

A post-award examination of the first major contract handled under the Total Package Procurement Concept ("Total Package Concept" by Major General Charles H. Terhune, Jr., USAF, *Defense Industry Bulletin*, February 1966) revealed not only that excessive paperwork requirements were levied, but that the proposers submitted considerably more data than was required. Assistant Secretary of the Air Force (Installations and Logistics) Robert H. Charles told a DIAC meeting on this point: "The fact that each competitor submitted an average of 7,000 pages of cost data, in a competition for a fixed-price contract, speaks for itself." This Air Force post-award examination was so productive that other similar reviews will be made particularly aimed at uncovering areas of excessive paperwork burden.

As a further measure, the Office of the Secretary of Defense (OSD) has kept a hand on both throttle and brake in the program using Cost Information Reports to improve the DOD store of cost performance data on large systems acquisitions contracts. OSD approval is required before actual data collection requirements may be written into new contracts. The OSD Data Plan Review Committee is now an active regulatory mechanism at the Pentagon.

As other fruitful areas for investigation appear, they will be examined in line with Secretary Ignatius' directive. However, all such efforts will move forward with two principles regularly observed.

First, any such examination will be made in coordination with the major program involving technical and management systems data previously described so that duplicative efforts are avoided.

Second, none of these examinations will be handled in such a way as to generate, in themselves, additional paperwork requirements.

As Secretary Ignatius stated in regard to the control of paperwork, "the task is a never-ending one." A major part of the solution must always be found, therefore, in a never-ending search for ways to minimize and eliminate. This article was written, in part, merely to focus attention

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A Model for the Areal Pattern of Retail and Service Establishments Within an Urban Area. Northwestern University for the Navy, April 1966, 49 pp. Order No. AD-634 020. $2.

Satellite Doppler Navigation for Small Craft. Johns Hopkins University Applied Physics Labs, for the Navy, Aug. 1965, 68 pp. Order No. AD-631 024. $3.

Polyimides. Princeton University for the Navy, May 1965, 23 pp. Order No. AD 463 880. $1.

Thermal Degradation Processes in Polysiloxanes and Thermal Stabilization by a Cerium Inhibitor. Naval Research Laboratory, Washington, D.C., April 1966, 26 pp. Order No. AD-633 068. $1.

Properties of Linear Elastomeric Polyurethanes. Princeton University for the Navy, May 1966, 20 pp. Order No. AD 633 787. $1.

Research on Substituted Fluorocarbons (U). Maremont Corp., Pasadena, Calif., for the Navy, April 1965, 14 pp. Order No. AD 465 146. $1.

Broad Band VLF Transmitting Stagger Tuned Dipole. Naval Ordnance Laboratory, Corona, Calif., May 1966, 27 pp. Order No. AD-633 859. $2.

Electronically Steerable Array. Sylvania Electronic Systems for the Air Force, April 1966, 67 pp. Order No. AD 633 495. $3.

Portable Field Recording System. General Motors Sea Operations Dept., Santa Barbara, Calif., for the Navy, May 1966, 21 pp. Order No. AD-633 835. $1.

Procedures for the Chemical Analysis of Copper Base Alloys. Naval Research Laboratory, Washington, D. C., March 1966, 16 pp. Order No. AD-631 067. $1.

Investigations of the Mechanisms of Decomposition, Combustion and Detonation of Solids. Aerojet-General Corp., Sacramento, Calif., for the Air Force, March 1965, 240 pp. Order No. AD 458 864. $6.

Atom Recombination on Surfaces. McGill University, Montreal, Canada, for the Air Force, Nov. 1965, 47 pp. Order No. AD 630 389. $2.

Discontinuities in the Surface Structure of Alcohol-Water Mixtures. Naval Radiological Defense Laboratory, San Francisco, Calif., Nov. 1965, 49 pp. Order No. AD-628 351. $2.

> Government research and development reports are available to science and industry at price indicated from:
>
> Clearinghouse for Federal and Scientific Information
> Department of Commerce
> Springfield, Va. 22151
>
> Authorized R&D contractors and grantees may obtain these documents without charge from:
>
> Defense Documentation Center
> Cameron Station
> Alexandria, Va. 22314

(*Continued from Page 7*)

Matching ideas with Air Force needs is also accomplished by technology reviews conducted for the Air Force by large aerospace industries. An improved understanding of Air Force needs has resulted from lectures and hardware displays during the program reviews.

The widespread dissemination of Air Force requirements assists industry in evaluating laboratory efforts which may be applied to Air Force needs. However, real progress on translating today's laboratory ideas into tomorrow's weapon systems begins with the issuance of a Defense contract assuring funds for development of the innovation.

The all-important aerospace Defense contract can be obtained by an Air Force request for proposal or by submission of a voluntary proposal to the Air Force. An Air Force request for proposal is forwarded by procurement offices to qualified sources for accomplishment of a specific task or project. Direct Air Force solicitation is limited to industries with a known capability for accomplishing the desired research and development work. The industries interested in the work respond directly to the Air Force by bidding for a contract.

Submission of a voluntary or unsolicited proposal directly to the responsible Air Force laboratory might result in a contract if the proposal significantly advances the state of the art and provides potential solutions to Air Force technical needs. Annual contract awards for unsolicited proposals average more than $30 million. Any individual or business organization interested in marketing an idea is encouraged to obtain advance guidance directly from the appropriate RTD field unit for assistance in coupling the innovation to Air Force requirements prior to submission of the proposal. The division policy protects unsolicited proposals containing proprietary data if such proposals submitted are clearly marked.

Effective marketing of new ideas for use in acquiring qualitatively superior weapon systems for the future can only be accomplished by a cohesive research and development aerospace team effort. An investment of industry ideas in Air Force technology today will assure our nation's security for tomorrow.

AFSC SCIENTIFIC AND TECHNICAL LIAISON OFFICES (STLO's)

Area STLO's

AFSC STLO (RTSAA)
c/o The Boeing Co.
Seattle, Wash. 98124

AFSC STLO (RTSAN)
111 East 16th St.
New York, N.Y. 10003

AFSC STLO (RTSAB)
Waltham Federal Center
424 Trapelo Road
Waltham, Mass. 02153

AFSC STLO (RTSAO)
225 Jarvis St.
Toronto, Ontario, Canada

AFSC STLO (RTSAC)
O'Hare International Airport
P.O. Box 9626
Chicago, Ill. 60666

AFSC STLO (RTSAS)
International Science Center
452 DeGuigne
Sunnyvale, Calif. 94086

AFSC STLO (RTSAD)
500 S. Ervay St.
Dallas, Tex. 75201

AFSC STLO (RTSAW)
c/o Department of the Navy
Room 3543, Munitions Building
Washington, D.C. 20360

AFSC STLO (RTSAE)
113 St. Clair Ave., N.E.
Cleveland, Ohio 44114

AFSC STLO (RTSUM)
Massachusetts Institute of Technology
68 Albany St.
Cambridge, Mass. 02139

AFSC STLO (RTSAL)
AF Unit Post Office
Los Angeles, Calif. 90045

Host STLO's

ARMY

AFSC STLO (RTSRA)
Aberdeen Proving Ground
Building Number 314
Aberdeen Proving Ground, Md. 21005

AFSC STLO (RTSRF)
U.S. Army Electronics R&D Laboratory
Fort Monmouth, N.J. 07703

AFSC STLO (RTSRP)
Hq., Army Munitions Command
Picatinny Arsenal
Dover, N.J. 07801

AFSC STLO (RTSRE)
Building 5101
Edgewood Arsenal, Md. 21010

AFSC STLO (RTSRZ)
U.S. Army Tropic Test Center
P.O. Drawer 942
APO, New York 09827

NAVY

AFSC STLO (RTSND)
U.S. Naval Air Development Center
Johnsville, Warminster, Pa. 18974

AFSC STLO (RTSNR)
Naval Research Laboratory
Washington, D.C. 20390

AFSC STLO (RTSNM)
Naval Missile Center
Point Mugu, Calif. 93041

AFSC STLO (RTSNT)
Naval Ordnance Test Station
China Lake, Calif. 93556

NASA

AFSC STLO (RTSSA)
Ames Research Center (NASA)
Moffett Field, Calif. 94035

AFSC STLO (RTSSM)
NASA Manned Spacecraft Center
Houston, Tex. 77017

AFSC STLO (RTSSL)
Langley Research Center (NASA)
Langley Air Force Base, Va. 23365

AFSC STLO (RTSSW)
Lewis Research Center (NASA)
21000 Brookpark Road
Cleveland, Ohio 44135

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(*Continued from Page 25*)

on this important problem to enhance that never-ending search. But it is not enough that the Defense Department alone conducts such a search. Each major defense contractor must examine his requirements levied upon subcontractors, and each major subcontractor, in turn, upon his subcontractors. As productive results are obtained which can be emulated, or as problems are uncovered which can only be solved by DOD, information should be forwarded to the Defense Department. Only in this way, by the efforts and cooperation of all concerned, can a Reduction In Paperwork be achieved.

Foreign Military Sales and Purchases Through Calendar Year 1965

by
Hugh J. Gownley and Leonard A. Alne

Foreign military sales are authorized by Congress as a means of replacing or supplementing Grant Aid for the purpose of facilitating the kinds of arrangements for individual and collective security required to promote world peace and the foreign policy, security and general welfare of the United States. The extent of these sales became more feasible as the economic and financial capabilities of our allies improved by the early 1960's. In the same time period, the balance of payments effects of deploying U.S. forces abroad were severely felt by this nation.

In FY 1961 a vigorous program of military sales was started to replace Grant Aid to the developed countries and assist in maintaining economic capability to deploy forces abroad in a forward strategy.

During the past four and a half years a total of $10.5 billion in orders and commitments has been accumulated. The industrialized nations of Europe and the Far East account for more than nine billion dollars of this total with the minor balance of one and one-half billion dollars spread throughout more than 30 countries.

Apart from the offset of about 55 percent of the foreign exchange costs of our forces deployed abroad (exclusive of Vietnam), the sales program during FY 1962-1966 fed orders into all 50 states, creating 1,400,000 man-years of employment in 40,000 firms in more than 1,500 cities.

Mr. Hugh J. Gownley is Dep. for Management to the Dep. Asst. Secretary of Defense (International Logistics Negotiations), Office of Asst. Secretary of Defense (International Security Affairs). He also supervises the activities of the Federal Republic of Germany, European and Latin American Directorates.

Independent of the sales program, the expenditures for equipment procured abroad by U.S. forces during FY 1962-1965 and first half of FY 1966 totaled $761 million (see chart). The rate of such expenditures is declining ($143.3 million in FY 1965 and $46.9 million during July-December 1965) as a result of the special DOD 50 percent rule (favoring U.S. suppliers). Further, substantial reductions are unlikely because the "return" of optional procurement to the United States has now left almost exclusively those expenditures (e.g., public utilities, fuels, food and local economy expenditures) which must continue as long as U.S. forces and their dependents are abroad.

In connection with sales agreements, the F-111 arrangement with the United Kingdom concluded April 6, 1965, and amended Feb. 21, 1966, is the only recent sale involving agreement on the part of the United States to purchase abroad, but it is indicative of the two-way street character that the sales program must be prepared to assume. In contemplation of an aircraft purchase (C-130, F-4 and F-111) of about two billion dollars, British authorities first proposed that DOD guarantee certain reverse procurement of defense equipment from the United Kingdom. DOD rejected this proposal on the grounds that allocated procurement invites high cost and inefficient procurement. DOD did agree, however, to search out items for which British sources appear competitive and to invite British bids for such items on the basis of equal competition (i.e., no differentials) with U.S. sources. A target of $825 million was established for such procurement over the ten-year period 1966-1975. More than 150 items have been identified as potential from United Kingdom sources under terms of cost, quality and delivery competition with U.S. industry.

We identified the major item of noncombatant small naval vessels as one that the United Kingdom might certainly provide competitively. On its first competition, however, the British yard submitted a bid 25 percent higher than the winning U.S. bid (Marinette Shipyard in Wisconsin); and the British estimate of manhours required was 2.8 times that of Marinette. However, among U.K. successes are their low bids for two ocean-going survey vessels for a total of $16.73 million and one salvage vessel for seven and one-half million dollars. In addition, the U.S. Air Force plans to use a version of the Rolls Royce Spey engine in A-7 aircraft. The engines will be built in the United States by Allison Division of General Motors, initially using engines and components supplied by Rolls Royce valued at about $100 million.

On May 13, 1966, Secretary of Defense McNamara entered into a framework agreement with West German Minister of Defense von Hassel for the purchase of Hispano-Suiza 820 20mm guns after having been advised by the Secretary of the Army that the U.S. testing program on the gun and ammunition had been completed with successful results. While we have no commitment to purchase from Germany, the Army tests showed conclusively that the best weapon available to meet a critical Army requirement in the immediate

Mr. Leonard A. Alne is Dep. for Weapon Systems Planning, to the Dep. Asst. Secretary of Defense (International Logistics Negotiations), Office of Asst. Secretary of Defense (International Security Affairs). He also supervises the activities of the United Kingdom, Near East and Far East Directorates.

time frame is the Hispano-Suiza 820 20mm gun. Therefore, in terms of available guns to meet our requirements, it appeared reasonable and in the best interest of the United States that about $75 million for this gun procurement be authorized from Germany, a country that has been spending annually some $600-$700 million for military materiel and services in the United States.

The Defense Department accepts the need for a two-way street in international defense transactions for the basic reason that we do not think that we will be able to maintain our high level of export sales unless we evidence our willingness to procure abroad at least a portion of the value of such sales. We will avoid being maneuvered into any agreement which allocates procurement. We will stress competitive procurement.

U. S. policy objectives in international armaments and defense logistics arrangements are based on and associated with other national objectives to:

- Encourage controlled disarmament.
- Avoid arms races.
- Tailor acquisitions of defense equipment to valid military requirements, available manpower capabilities, and competing social claims against national resources.

Within these constraints, the United States employs the whole battery of cooperative research and development, coproduction sales and competitive procurement from foreign sources with the following aims:

- To encourage increased allied defense capability—tempered by concern with the demands of economic development and political realities.
- To sell U.S.-produced defense equipment to free-world, financially capable buyers—tempered by a willingness to consider coproduction or licensed production abroad when sale seems precluded.
- To share U.S. technology with our allies so as to evoke their defense effort without incurring duplicative costs—tempered by the need to avoid a gratuitous weakening of the U.S. competitive position.
- To make first-line equipment available to our allies—tempered by a need to avoid uncompensated security risks of compromise.
- To be willing to procure selected defense equipment abroad for use by U.S. forces as part of large scale foreign purchase programs in the United States under competitive arrangements including participation by the United States when this nation can be assured of quality, cost, delivery and support terms equal to those obtainable from U.S. industry.
- To encourage the growth of an economically, politically and technologically strong North Atlantic Treaty Alliance—tempered by continuing attention to the effect of each action of logistics cooperation on other U.S. national objectives and on all sectors of the U.S. economy.

MAJOR MILITARY EQUIPMENT U. S. DEFENSE EXPENDITURES ABROAD ENTERING THE INTERNATIONAL BALANCE OF PAYMENT FISCAL YEARS 1962–1965 AND THE FIRST HALF OF FY 1966

($ Millions)

Region	FY 1962	FY 1963	FY 1964	FY 1965	Total FY 62–65	First Half FY 1966	Grand Total
EUROPE	73.1	73.1	57.7	62.9	266.8	22.4	289.2
NEAR EAST & SO. ASIA	1.9	1.0	.4	--	3.3	--	3.3
FAR EAST	54.8	52.2	25.2	4.5	136.7	2.0	138.7
AFRICA	.1	--	--	--	.1	--	.1
WESTERN HEMISPHERE	37.8	67.9	113.0	75.6	294.3	20.3	314.7
OTHER	.2	--	12.4	.3	12.9	2.2	15.1
GRAND TOTAL	167.9	194.2	208.7	143.3	714.1	46.9	761.0

As of 31 December 1965

Redesign Doubles Capability of Navy's Sub Rescue Vehicle

The U.S. Navy has redesigned its prototype submarine personnel rescue vehicle, known as the Deep Submergence Rescue Vehicle (DSRV), increasing the rescue capacity from 12 to 24 people.

Although the increase in rescue capacity adds about 5,000 pounds to the weight of the vehicle, it still retains its speed potential and air transportability. Two major advantages in the revised design are increased mission reliability by reducing equipment operation time, and increased crew survival time aboard a distressed submarine from 24 to 48 hours.

Increased crew life survival time aboard a distressed submarine is possible because the greater rescue capacity of the DSRV provides more space for greater amounts of oxygen and lithium hydroxide to be taken down and transferred to compartments within a stricken submarine.

Construction of the DSRV prototype will be completed and delivery made to the Navy in June 1968. The submersible will then become the first part of a "rescue mission system" to provide the Navy with a high probability of an on-the-scene submarine rescue capability anywhere in the world within a 24-hour period. By 1970 the Navy plans to have six DSRV's completed which will provide worldwide submarine rescue capability.

Lockheed Missiles and Space Co., Sunnyvale,Calif., is designing and will construct the prototype vehicles.

Army R&D Lab Evaluates Silent Power Turbine Unit

"Silent power" of a 3-kilowatt turbine unit is being evaluated by the Army Engineer R&D Laboratories, Fort Belvoir, Va. for possible use in forward areas.

The experimental mercury Rankine cycle power unit—inaudible at 100 meters—is one of three power sources with low-noise characteristics being studied by the Army.

The Rankine system consists of a burner, a mercury preheater and boiler, a mercury vapor turbine, air-cooled condenser, mercury-feed pump and controls. Production units would weigh less than 200 pounds.

The turbine is designed for 24,000 r.p.m. to drive a direct-connected alternator. The turbine-alternator-feed pump assembly is hermetically sealed with rotating components on a single shaft.

The model will run on any liquid hydrocarbon fuel including gasoline, "CITE," and JP-4.

AFSC Aerospace Medical Division Plays Key Role in Manned Flight Advances

by
Brig. Gen. Charles H. Roadman, USAF

On November 1, the Aerospace Medical Division (AMD) of the Air Force Systems Command will celebrate its fifth anniversary. The most important single fact about the Aerospace Medical Division is the breadth of its mission. When the division was formed in 1961, it was given the three-fold responsibility for aerospace medical research and development, medical education and clinical medicine.

We perform research in support of aerospace systems development. We practice clinical medicine, primarily in support of aerospace operations, and we conduct teaching programs in the specialized techniques of aerospace medicine and its related disciplines. The philosophy behind this three-fold mission is that each facet of the total effort supports the other two. It provides a favorable climate for rapid advancement in medical knowledge with wide and prompt dissemination of new concepts into medical and operational practice. Medical research and development account for the largest part of our total effort. Roughly, 70 percent of our budget, our physical facilities and the talents of our professional and technical people are spent on research and development programs.

Clinical practice claims about 20 percent and the balance of 10 percent goes into medical education. Of course, there is a good deal of interchange in personnel and equipment between the three missions. The research people also do some teaching and they may participate in medical practice too, especially in connection with experimental programs. Clinical personnel also do research and teaching, and the teaching staff engage in medical practice and research.

The proportion of our total effort assigned to any one facet of the mission does not necessarily reflect the relative importance to the Air Force or to the nation. Our educational function, for example, is the prime source of trained specialists in aerospace medicine, not only for this country but for many of our allies. We have also trained most of the medical officials now with the airlines, in aerospace industries and with other Government agencies, such as the Federal Aviation Agency and the National Aeronautics and Space Administration (NASA).

From its headquarters at Brooks AFB, Tex., the Aerospace Medical Division commands, manages and plans for eight operating facilities at six geographical locations scattered as far away as Alaska and the Philippines. Each of these units has its own commander and their missions reflect the varied aspects of our AMD mission.

Wilford Hall USAF Hospital.

Wilford Hall USAF Hospital, located at Lackland AFB, Tex., is the prime clinical arm of the division. This 1000-bed facility serves as a base hospital for the Air Force's basic military training center, and receives complicated cases referred from all over the world. The hospital also contributes to our education mission by providing medical training in 18 specialty areas. It participates in our research and development program through its aerospace medical laboratory (clinical).

Aerospace Medical Research Laboratories.

The Aerospace Medical Research Laboratories at Wright-Patterson AFB, Ohio, conduct research in the fields of toxicology, biomechanics, human engineering and life support. Founded 32 years ago, primarily to design, fabricate and test new flying safety devices and systems for the protection of man in high speed aircraft, these laboratories now represent a capability in equipment and personnel not duplicated anywhere in the free world.

Brig. Gen. Charles H. Roadman, MC, USAF, is Commander of the Aerospace Medical Div., Brooks AFB, Tex. Gen. Roadman is a graduate of Northwestern University Medical School and a graduate of the Air Force School of Aviation Medicine. He is a Fellow of the Aerospace Medical Association and a member of the American Medical Association.

Aeromedical Research Laboratory.

At Holloman AFB, N.M., the division's Aeromedical Research Laboratory is the home of the largest trained research animal colony in the world. In addition to its work in impact studies, the laboratory trains Rhesus monkeys and chimpanzees to perform various discrete tasks. Baseline data is kept on the individual animals and on the species, thereby providing scientists with a good subject for use in those experiments not feasible for the human volunteer.

Arctic Aeromedical Laboratory.

Studies of human responses to the Arctic environment are carried out at AMD's Arctic Aeromedical Laboratory, which is located at Fort Wainwright, Alaska. In addition to testing cold weather survival equipment, this laboratory has been instrumental in the design and development of such survival equipment for aircrew members.

USAF Epidemiological Laboratory.

The division's Epidemiological Laboratory, located at Lackland AFB, is responsible for the investigation of epidemics any place in the world that might pose a threat to Air Force personnel. This organization was instrumental in preventing an epidemic of meningitis at Lackland AFB early this year. Early identification of the specific meningitis bacteria assisted the medical staff at Wilford Hall Hospital in treatment and enabled institution of early preventive measures that halted the epidemic. For the role it played in this, the organization received a citation from Headquarters, U. S. Air Force.

Fifth Epidemiological Flight.

A recent acquisition of the division is the Fifth Epidemiological Flight located at Clark Field, Philippines. Its mission includes the study and investigation of infectious diseases in the Far East and Southeast Asian areas.

USAF School of Aerospace Medicine.

The USAF School of Aerospace Medicine is collocated with the headquarters at Brooks AFB. The school got its start in 1917 as the Aviation Medicine Laboratory. The history and progress of aerospace medicine can be traced by the history and progress of the School of Aerospace Medicine.

In 1949, several years before Sputnik, the school organized the first department of space medicine in the free world. Since that time the school has played a key role in research in space

cabin atmospheres, radiation hazards, disorientation and a variety of other problems encountered in aerospace operations. The school conducts 30 courses in specialized training that vary in length from three days to three years.

The School of Aerospace Medicine has conducted the medical evaluation of the Air Force's aerospace test pilots, as well as all the NASA astronauts, except the seven Mercury astronauts. In addition, the school conducts a referral service for aircrew members whose flight status is questioned because of medical reasons. A thorough, detailed medical evaluation, which the school is capable of giving, has resulted in return to flying status of aircrew members who might otherwise have been grounded. During the past six years this has resulted in a potential savings to the taxpayer of over a quarter of a billion dollars in training costs.

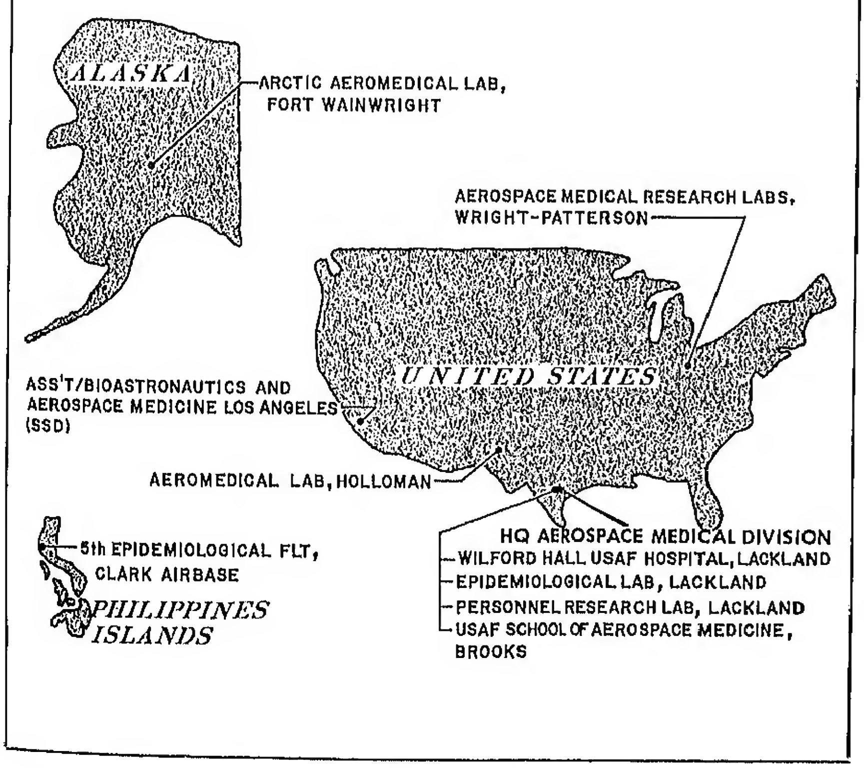
In addition to specific achievements, the Aerospace Medical Division has made a concerted effort to support our forces in Southeast Asia (SEA). In addition to providing some of our best trained medical personnel to medical facilities in SEA, our research and development personnel have been responsible for a number of items in direct support of SEA.

To provide comfort to pilots flying in unventilated aircraft at low altitudes in tropical climates, our researchers adapted a rubberized vest circulating chilled water through tubes from an ice chest, using an electric pump. The vest weighs approximately three pounds and is worn under the flying suit. The weight of the entire unit for two men is less than 50 pounds, including 25 pounds of ice, and it occupies about one cubic foot of space. In a humid atmosphere at temperatures of 115 degrees Fahrenheit, it cools two men for a period of two hours.

Back in 1963 the human engineering people in our laboratories at Wright-Patterson AFB started working on a theory of lateral sighting techniques for aircraft. A modified gunsight was devised from this lateral firing concept and was tested in a C-47 aircraft. This led to the development of "Puff the Magic Dragon." These same laboratories also developed a Two Light Landing approach system for unimproved airfields, which is being tested in Vietnam at the present time.

Other developments now being evaluated include a litter rack system for air evacuation flights. This new development enables medical attendants to draw a litter from its normal flight position while a patient receives whatever care is needed. The litter then slides back and is locked in its regular place. An improved model of this system has been given static tests and is now being flight-tested in the C–141.

An outstanding example of systems-oriented work has been our research on habitable atmosphere for space cabins. These experiments have been performed both for NASA, validating the Gemini Apollo cabin environments, and for any Air Force extended space flight including the Manned Orbiting Laboratory.



Recent studies indicate that no untoward effects result from the use of an atmosphere composed of 70 percent oxygen and 30 percent helium at a pressure of five pounds per square inch. Earlier experiments had shown that an atmosphere of 100 percent oxygen at the same pressure could be tolerated for a period of at least 30 days. We are now able to offer the systems designer a choice of several cabin environments that will not impair the ability of the crew to function.

The possibility of damage to a spacecraft in flight has raised the question of emergency procedures after an explosive decompression. Our concern is not only with the time of useful consciousness, but more especially with the time available to save the crewman's life and to prevent permanent brain injury.

Chimpanzees, trained to perform discrete tasks, have been exposed to a near vacuum for as long as three and one-half minutes. After recompression and a four-hour interval for recovery, they performed at a level consistent with their capability before exposure. The exposure time of three and one-half minutes cannot be extrapolated directly to human beings. However, it does imply that full recovery is possible after a longer exposure than had been suggested previously.

In biomechanics, we study the effects of transient accelerations, vibrations and impact. Test equipment now in use includes drop towers, various other motion simulators and the horizontal track. In the past year, we have evaluated the F-111 restraint harness, the shifting center of gravity during simulated ejection from the Gemini B, and the vibration levels expected during flights of high-speed aircraft at very low altitudes.

In the next few months, the new Dynamic Escape Simulator should become fully operational at Wright-Patterson. This is really a complex motion simulator, with which we can generate acceleration forces together with vibration, changes in pressure and variations in temperature. We have examined these stresses individually for years. Now, for the first time, we can produce them in realistic combinations and sequences—as they are actually experienced in flight.

From the early days of aviation, components of the present Aerospace Medical Division have paralleled the extraordinary achievements of aircraft engineers in evolving high-speed, high-altitude flight systems by reconciling them with human needs and limitations. These advances have contributed significantly to the safety and comfort of passengers in modern jet transports. Since World War II the same progress has continued by extension to rocket aircraft and space vehicles. Eventually these innovations will be enjoyed routinely by travelers in supersonic transports, orbital gliders and inter-planetary spacecraft. The work that is going on within the Aerospace Medical Division today will play a key role in this development.

CALENDAR OF EVENTS

Sept. 22-23: Government-Industry Procurement Clinic, Seattle, Wash. Contact: Tom Hynes Jr., Dept. of Commerce & Economic Development, 312 First Ave. N., Seattle, Wash.

Sept. 24-Oct. 2: Greater Jackson Chamber of Commerce Midwest Space Fair, Jackson, Mich.

Sept. 26-28: Marine Systems Conference, Los Angeles, Calif.

Sept. 26-28: Sixth Annual National Conference on Environmental Effects on Aircraft and Propulsion Systems, Princeton, N.J.

Sept. 27: Industrial Procurement Conference, Oakland, Calif.

Sept. 27-30: American Roentgen Ray Society Meeting, San Francisco, Calif.

Sept. 28-29: National Security Industrial Assn. Marine Geodesy Symposium, Columbus, Ohio.

Sept. 30: Industrial Procurement Conference, San Bernardino, Calif.

Oct. 1-2: Akron-Canton Airport Aviation Days, Akron-Canton Airport, Ohio.

Oct. 2: Winston-Salem Jaycee Air Fair, Smith Reynolds Airport, Winston-Salem, N.C.

Oct. 2-14: Fourth Annual Research and Development Management Program, Battelle Memorial Institute (Ohio) and Ohio University, Columbus, Ohio.

Oct. 3-5: International Electronics Conference and Exhibition, McCormick Place, Chicago, Ill.

Oct. 3-5: Institute of Electrical and Electronics Engineers Aerospace and Electronics Convention, Washington, D.C.

Oct. 4: Industrial Procurement Conference, Tucson, Ariz.

Oct. 4: Industrial Procurement Conference, Marietta, Ohio.

Oct. 4-6: American Oil Chemists Society Meeting, Philadelphia, Pa.

Oct. 5-7: International Assn. of Electrical League Meeting, Scottsdale, Ariz.

Oct. 6: National Security Industrial Assn. Annual Meeting and Dinner, Washington, D.C.

Oct. 7: Industrial Procurement Conference, Albuquerque, N.M.

Oct. 7: Society of American Military Engineers Meeting, St. Paul, Minn.

Oct. 9-14: Electrochemical Society Meeting, Philadelphia, Pa.

Oct. 10-12: Assn. of the U.S. Army Meeting, Sheraton-Park Hotel, Washington, D.C.

Oct. 11-12: Air Techniques for Air Electronics Meeting, Washington, D.C.

Oct. 11-13: Armed Forces Management Assn. National Conference, Shoreham Hotel, Washington, D.C.

Oct. 17-21: American Society of Civil Engineers Meeting, Philadelphia, Pa.

Oct. 18-20: American Society of Mechanical Engineers Meeting, Minneapolis, Minn.

Oct. 19-21: Institute of Electrical and Electronics Engineers Meeting, Boston, Mass.

Oct. 25-26: Ninth Navy/Industry Conference on Material Reliability, Washington, D.C.

Oct. 27-28: Tulsa Chamber of Commerce Air Festival, Riverside Airport, Tulsa, Okla.

Oct. 31-Nov. 2: Defense Supply Assn. National Convention, Benjamin Franklin Hotel, Philadelphia, Pa.

Nov. 2: Industrial Management Society Meeting, Chicago, Ill.

Nov. 2-4: Northeast Electronic Research & Engineering Meeting, Boston, Mass.

Nov. 2-4: Air Force/National Security Industrial Assn. Meeting, Patrick AFB, Fla.

Nov. 8-10: Joint Computer Conference, San Francisco, Calif.

Nov. 9: National Security Industrial Assn. Meeting, Naval Ordnance Laboratory, Corona, Calif.

Nov. 14-16: American Petroleum Institute Meeting, New York City.

Nov. 15-17: Ships Control Systems Symposium, Annapolis, Md.

Nov. 17: Industrial Procurement Conference, Louisville, Ky.

Nov. 29-Dec. 2: American Institute of Aeronautics and Astronautics Annual Meeting and Technical Display, Boston, Mass.

DOD Procurement Conferences Under Way; Seattle Scene of Fifth Session

The fifth in a series of 14 DOD Procurement Conference Programs, scheduled for FY 1967 will be held in Seattle, Wash., Sept. 22-23, under the sponsorship of the Washington State Department of Commerce.

The conferences are designed to provide, in one location, a place for the businessman and potential contractor to become acquainted with the Federal procurement and contract process; to have practical individual discussions with specialists on business opportunities in the Army, Navy, Air Force and Defense Supply Agency; and to be counseled on surplus sales and the activities of the Defense Contract Administration Service, the Defense Documentation Center, and other Defense organizations concerned with prime contracting and subcontracting.

An item of special interest at the conferences will be the \$30 to \$40 million in current Invitations For Bids (IFB) and Requests For Proposals (RFP), including a number of "small purchase" (\$2,500 and under) packages which will be on hand with Army, Navy, Air Force and DSA counselors.

In addition, DOD prime contractors from the area contiguous to the conference site will be on hand to discuss subcontract opportunities.

DOD will be joined in the procurement conferences by several other Federal agencies, including the Department of Commerce, the Small Business Administration, the National Aeronautics and Space Administration and the General Services Administration. In addition, the Atomic Energy Commission, Veterans Administration, Department of the Interior, Department of Agriculture and other agencies will participate in conferences in which there is an area of interest in their activities.

The Procurement Conference Program is part of DOD's continuing effort to develop additional competitive sources, large and small, to meet defense requirements. The first conference of this year's series was held in Lewiston, Maine. Others have been convened at Milwaukee, Wis.; Rochester, N.Y.; and Portland, Ore.

Subsequent conferences have been scheduled for the following dates and locations:

Sept. 27—Oakland, Calif.
Sept. 30—San Bernardino, Calif.
Allentown, Pa.
Oct. 4—Tucson, Ariz.
Marietta, Ohio
Oct. 5-6—Annapolis, Salisbury and Elkton, Md.
Oct. 7—Albuquerque, N.M.
Nov. 17—Louisville, Ky.

(*Continued from Page 19*)

The aerospace industry working on Government negotiated contracts does not have precisely the same competitive environment. However, we have seen Government contracts provide bonus and penalty incentives to stimulate improved reliability. These dollar incentives are first felt by the stockholder and top level management of a company. The challenge and the opportunity is to find ways of extending these incentives to the designer, the engineer, and the worker who must build the quality into the hardware.

The aerospace industry gave birth to formalized programs designed to develop individual pride in workmanship. This concept has been adopted, fostered and encouraged by DOD. Most aerospace contractors today have instituted a formal Zero Defects Program. Evidence of substantial achievement has been recognized by the Air Force with its Zero Defects Achievement Award.

Once embarked on such a program, many contractors have applied imagination and resourcefulness to develop techniques of their own which will assist the worker to identify himself with the quality of his product and, thereby, achieve recognition for excellence of craftsmanship.

Value engineering is a concept which in its earliest application seemed to emphasize after-the-fact review of engineering design. After this concept takes root in aerospace companies, it must graduate to the stage where it is an essential element of the initial design process. The impact of automated data processing, computing, storage and retrieval has only begun to relieve designers and engineers of the mundane and time-consuming tasks, leaving their minds free for creative thought. The introduction of graphic display to computer storage and processing capability should soon enable a designer to prove on his drawing board what once took years of construction and test.

In our pursuit of 100 percent reliability, we must not overlook improvement of the tools which we now have. The need for hardware inspection will always be with us. Where it is less than perfect, redundancy will be necessary. We must, however, improve procedures, techniques, documentation and equipment. There is an endless need for non-destructive testing equipment not yet invented. Education and training of quality engineers and technicians must be revitalized and periodically updated. Industry, Government and professional organizations must work together in molding and developing these advances through the exchange of ideas, experiences and theories.

In the previous paragraphs, I have talked of some evolutionary improvements which must be made in the tools that we now use. I talked earlier of some new concepts which must be expanded and applied in new ways.

To achieve the consistent reliability needed to meet the very demanding requirements of future space ventures will not require a major breakthrough in the state of the art. If management in the aerospace industry can apply to these challenges the imagination and resourcefulness which have marked their past scientific and technical pioneering, there can be no doubt that the successes of Mercury and Gemini will be only the initial stepping stones in the exploration of our universe. Perhaps equally important will be the demonstration that our economy can afford to lead the world in space exploration without sacrifice of major objectives that are sorely needed to advance the standards of living here on earth.

Famed Radar Scientist Joins Army Electronics Command

Dr. Andrew Longacre, professor of engineering sciences at Syracuse University and a nationally famed radar scientist and inventor, has begun a tour as a visiting professor with the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J.

Dr. Longacre, longtime member and former chairman of the command's Electronic Advisory Group, is on sabbatical leave from Syracuse.

Long associated with radar research, and particularly noted for his work in side-looking radar, Dr. Longacre will devote his work at Fort Monmouth to radar and its application phases. He will be associated with Dr. Robert S. Wiseman, director of the CS-NV-TA Laboratories, and Victor L. Friedrich, deputy director and also a veteran radar researcher.

Dr. Longacre also will continue his duties as a member of the Electronics Advisory Group, comprising top-level electronic scientists, engineers and executives who provide advice and assistance to the commanding general of ECOM in the fulfillment of the command's missions.

(*Continued from Page 24*)

us, and an orderly, step-by-step improvement along these lines. I would expect that the best area for initial attention would be those new systems in which we do not have to press the technological state of the art too far, and whose eventual use is well understood and subject to quantitative analysis. But even in these cases, it might be wise, for a while, to retain certain of the classic parameters in the contract language as a hedge against the uncertainty surrounding the new technique.

I believe this is the direction in which we should move. Since both Government and industry are intimately involved, it is something we must work out together, and doing so requires an understanding of systems analysis techniques by both parties. Although the problems may be complex, the objective is simple: we would like to give you a better opportunity to exercise your talent and ingenuity in designing, developing and producing weapons that will better satisfy our real needs, rather than our arbitrary specifications.

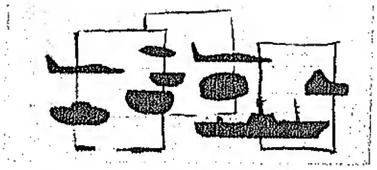
We feel confident that we have a powerful tool in systems analysis, and that it is reducing some of the inevitable uncertainty surrounding important decisions. However, we in the Office of the Secretary of Defense cannot assure single-handedly that the full benefits of quantitative analysis will be realized in our national defense program. To do that requires the assistance of all concerned, and I trust that this brief account of our views will help to enlist industry's support.

European Command Headquarters Will Move to Germany

The Defense Department has announced that Headquarters, U.S. European Command, now located at Camp des Loges, France, will be transferred to Stuttgart, Germany.

The new location was chosen with the agreement of the Federal Republic of Germany and after the other North Atlantic Treaty Organization nations were informed.

Relocation of European Command headquarters is the second major step in DOD's program to rearrange and streamline the U.S. military command structure in Europe as a result of the necessity to relocate U.S. military forces from France.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of August 1966:

DEFENSE SUPPLY AGENCY

2—Sinclair Refining Co., New York City, N.Y. $1,225,500. 12,600,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

3—Formacroft Equipment Co., Pulaski, Va. $1,830,061. 300,000 coated nylon twill ponchos. Pulaski. Defense Personnel Support Center, Philadelphia, Pa.

5—Riegel Textile Corp., New York City, N.Y. $9,385,800. 18,500,000 square yds of cotton sateen cloth. Defense Personnel Support Center, Philadelphia, Pa.

—J. P. Stevens & Co., New York City, N.Y. $2,024,756. 4,021,250 square yds of cotton sateen cloth. Defense Personnel Support Center, Philadelphia, Pa.

5—Ames Textile Corp., Lowell, Mass. $1,452,600. 180,000 wool blankets. Defense Personnel Support Center, Philadelphia, Pa.

—J. P. Stevens & Co., New York City, N.Y. $1,982,366. 200,000 wool blankets. Defense Personnel Support Center, Philadelphia, Pa.

—Cleveland Woolens, Cleveland, Tenn. $1,614,000. 200,000 wool blankets. Defense Personnel Support Center, Philadelphia, Pa.

—Oscar Mayer & Co., Madison, Wis. $2,134,863. 5,644,800 5½-ounce cans of sliced cooked pork. Defense Personnel Support Center, Philadelphia, Pa.

—Mobil Oil Corp., New York City, N.Y. $1,537,000. 900,000 barrels of Grade F.S. #6 burner fuel oil. Defense Fuel Supply Center, Alexandria, Va.

17—State Industries, Los Angeles, Calif. $6,313,687. 22,900 general purpose tents. Los Angeles. Defense Personnel Support Center, Philadelphia, Pa.

18—Valley Metallurgical Processing Co., Essex, Conn. $1,566,500. 5,000,000 pounds of aluminum powder. Essex. Defense General Supply Center, Richmond, Va.

—Aluminum Company of America, Pittsburgh, Pa. $1,320,000. 4,000,000 pounds of aluminum powder. Pittsburgh. Defense General Supply Center, Richmond, Va.

19—Howard Knit Products, Inc., Gastonia, N.C. $1,555,439. 2,931,648 men's white undershirts. Gastonia. Defense Personnel Support Center, Philadelphia, Pa.

—Oregon Freeze Dry Food, Inc., Albany, Ore. $2,455,893. 1,890,000 subsistence packets. Albany. Defense Personnel Support Center, Philadelphia, Pa.

22—Monsanto Co., St. Louis, Mo. $3,278,224. 529,600 gallons of herbicide. Defense General Supply Center, Richmond, Va.

23—LaCrosse Garment Mfg. Co., LaCrosse, Wis. $1,321,250. Cotton duck tent shelter halves. LaCrosse. Defense Personnel Support Center Philadelphia, Pa.

—Outboard Marine Corp., Waukegan, Ill. $1,049,916. 795 centrifugal pumps. Waukegan. Defense Construction Supply Center, Columbus, Ohio.

24—King Wood Products, East Elmhurst, N.Y. $2,910,040. 266,000 canvas folding cots. East Elmhurst. Defense General Supply Center, Richmond, Va.

25—Cavalier Bag Co., Lumberton, N.C. $1,668,400. 10,000 packs of burlap sandbags and 62,000 packs of osnaburg sandbags. Defense General Supply Center, Richmond, Va.

—Chase Bag Co., New York City, N.Y. $1,564,265. 23,000 packs of burlap sandbags and 48,250 packs of osnaburg sandbags. Defense General Supply Center, Richmond, Va.

—Bemis Co., Minneapolis, Minn. $1,225,514. 2,000 packs of burlap sandbags and 48,976 packs of osnaburg sandbags. Defense General Supply Center, Richmond, Va.

—Consolibag, Inc., Philadelphia, Pa. $1,018,050. 40,000 packs of burlap sandbags and 13,000 packs of osnaburg sandbags. Defense General Supply Center, Richmond, Va.

—Peoples Co., Huntington, W.Va. $1,096,450. 10,200 small general purpose tents and 4,500 vestibule type, general purpose tents. Huntington. Defense Personnel Support Center, Philadelphia, Pa.

30—West Point-Pepperel, New York City, N.Y. $3,136,057. 2,417,000 yards of cotton duck cloth. New York City. Defense Personnel Support Center, Philadelphia, Pa.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or work to be Performed—Location Work Performed—Contracting Agency.

ARMY

1—General Motors, Ypsilanti, Mich. $11,646,810. 20mm automatic guns to be used in aircraft. Ypsilanti. Army Weapons Command, Rock Island, Ill.

2—Collins Radio Co., Addison, Tex. $1,000,000. Insulation provisioning kits for UH-1 helicopters. Addison. Navy Aviation Materiel Command, St. Louis, Mo.

—Atlantic Research Corp., Alexandria, Va. $2,257,200. XM 2 canisters and XM 1 explosive opener assemblies for XM47 mines. Alexandria and Gainesville, Va. Picatinny Arsenal, Dover, N.J.

4—Mason & Hanger—Silas Mason Co., Lexington, Ky. $3,479,535. Loading, assembling and packing 500 lb. bombs. Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Great Lakes Dredge & Dock Co., Chicago, Ill. $4,289,000. Work on the Yaquina Bay & Harbor Project. Newport, Ore. Engineer Dist., Portland, Ore.

5—Day & Zimmermann, Inc., Philadelphia, Pa. $21,164,859. Loading, assembling and packing miscellaneous medium caliber ammunition and components. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Atlantic Research Corp., West Hanover, Mass. $2,173,200. XM27 mines, and loading of XM2 canisters. West Hanover. Picatinny Arsenal, Dover, N.J.

—New Orleans Stevedoring Co., New Orleans, La. $15,274,288. Stevedoring and related terminal services, Gulf Outport, New Orleans. Eastern Area, Military Traffic Management and Terminal Service, Brooklyn, N.Y.

—American Machine & Foundry Co., Brooklyn, N.Y. $2,168,760. Fin assemblies for the 750 lb. bomb. St. Paul, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Consolidated Engineering Co., Baltimore, Md. $3,729,900. Construction of Officer Candidate School facilities consisting of 18 barracks, 1 mess hall, 9 administrative buildings, 4 classroom buildings, 2 instruction shops and an operation maintenance shop. Aberdeen Proving Grounds, Md. Engineer Dist., Baltimore, Md.

9—Space Corp., Dallas, Tex. $5,174,944. Mobile floating assault bridge transporters. Garland, Tex. Army Mobility Equipment Center, St. Louis, Mo.

—R. G. Le Tourneau, Inc., Longview, Tex. $2,078,125. Fin assemblies for the 750-lb bomb. Longview. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Cessna Aircraft, Wichita, Kan. $2,150,000. M172E trainer aircraft, data, training and spare parts. Wichita. Army Aviation Materiel Command, St. Louis, Mo.

10—Davis Construction Co., Memphis, Tenn. $1,443,000. Work on the Mississippi River and Tributaries—Channel Improvement Project. Engineer Dist., Memphis, Tenn.

—Construction, Ltd., Bordentown, N.J. $1,234,567. Alterations and improvements to existing barracks and support facilities, and construction of new concrete masonry classrooms for expansion of military occupational specialist training facilities at Fort Monmouth, N.J. Engineer Dist., New York City, N.Y.

—Brunswick Corp., Marion, Va. $3,693,819. Cartridge launchers. Sugar Grove, Va. Edgewood Arsenal, Md.

12—Thomas Construction Co., St. Joseph, Mo. $2,154,600. Erection of prefabricated buildings at Fort Leonard Wood, Mo. Engineer Dist., Kansas City, Mo.

—Gould National Batteries, St. Paul, Minn. $1,221,326. 12-volt storage batteries for general use. Monroe, Mich. Army Tank Automotive Center, Warren, Mich.

15—Admiral Corp., Chicago, Ill. $1,000,865. Various quantities of components for radio receiving sets (AN/ARC-54). Chicago. Army Electronics Command, Philadelphia, Pa.

—Bethlehem Steel Corp., Bethlehem, Pa. $3,500,000. Gun tube forgings for the 175mm gun. Bethlehem. Watervliet Arsenal, N.Y.

—Midvale Heppenstall Co., Philadelphia, Pa. $2,050,000. Tube forgings for the 175mm gun. Philadelphia. Watervliet Arsenal, N.Y.

—Raytheon Co., Bedford, Mass. $2,500,000. Contract definition phase for the SAM-D surface-to-air missile system. Bedford, Mass., and Orlando, Fla. Army Missile Command, Huntsville, Ala.

—Hughes Aircraft, Fullerton, Calif., $3,024,582. SAM-D missile system. Fullerton, Santa Monica and San Jose, Calif. Army Missile Command, Huntsville, Ala.

—RCA, Moorestown, N.J. $2,074,095. Contract definition phase for the SAM-D missile system. Moorestown, N.J. and Wichita, Kan. Army Missile Command, Huntsville, Ala.

16—General Motors, Delco Remy Div., Anderson, Ind. $2,143,420. 12-volt storage batteries. Anaheim, Calif. and New Brunswick, N.J. Army Tank Automotive Center, Warren, Mich.

—Fifth West, Inc., Seattle, Wash. $1,044,500. Work on the Libby Dam Project. Near Libby, Mont. Engineer Dist., Seattle, Wash.

17—AVCO Corp., Stratford, Conn. $1,245,553. Turbine rotor blades for T-53 engines for the UH-1 helicopter. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

18—Thiokol Chemical Corp., Bristol, Pa. $16,060,281. Loading, assembling and packing of miscellaneous illuminating shells and signals. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Chamberlain Corp., Waterloo, Iowa. $1,598,170. Metal parts for the 2.75 inch rocket. Waterloo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—L. T. Industries, Garland, Tex. $1,088,352. Fin assemblies for 750-pound bombs. Garland. Ammunition Procurement & Supply Agency, Joliet, Ill.

19—Raytheon Co., Lexington, Mass. $1,026,000. Metal parts for aerial bombs. Bristol, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

22—General Motors, Detroit, Mich. $21,565,188. Reactivation activities and production of 105mm projectiles at the St. Louis, Mo., Army Ammunition Plant. Ammunition Procurement & Supply Agency. Joliet, Ill.

23—Independent Lock Co., Fitchburg, Mass. $1,005,552. Adapter boosters for aerial bombs. Fitchburg. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Morrison-Knudson Co., Boise, Idaho. $3,689,091. Work on the Lower Monumental Dam, Snake River Project. Near Pasco, Wash. Engineer Dist., Seattle, Wash.

—Bell Helicopter Co., Fort Worth, Tex. $1,124,408. Rotor rudder blades for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—Amron Corp., Waukesha, Wis. $5,405,353. 20mm brass cartridge cases. Waukesha. Frankford Arsenal, Philadelphia, Pa.

24—Goodyear Tire & Rubber Co., Akron, Ohio. $1,968,685. Shoe assemblies for combat vehicles. Muncie, Ind. Army Tank Automotive Center, Warren, Mich.

—Northrop Corp., Anaheim, Calif. $6,134,156. Hawk missile launchers. Anaheim.

Army Missile Command, Huntsville, Ala.

26—Wilkenson Mfg. Co., Fort Calhoun, Neb. $1,127,237. 60mm cartridge fin assemblies. Fort Calhoun. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Eureka Williams Co., Bloomington, Ill. $7,183,679. 500- and 750-pound bomb components. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Control Data Corp., Bethesda, Md. $4,345,758. Developing, designing, fabricating and testing of equipment necessary to provide an experimental automated Tactical Operations System. Palo Alto, Calif., Minneapolis, Minn. and in Germany. Army Electronics Command, Philadelphia, Pa.

—Bergen Engineering Co., East Rutherford, N.J. $1,148,408. Construction of an ammunition development and engineering facility at Picatinny Arsenal, Dover, N.J. Engineer Dist., New York City, N.Y.

29—Remington Arms Co., Bridgeport, Conn. $26,994,303. Loading, assembling and packing of miscellaneous small arms ammunition and components. Lake City Army Ammunition Plant, Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Martin Marietta, Orlando, Fla. $2,623,609. Canisters. Orlando. Picatinny Arsenal, Dover, N.J.

—Philco Corp., Newport Beach, Calif. $2,310,000. Completion of development of XM30 helicopter armament sub-system. Newport Beach. Springfield Armory, Mass.

30—Harvey Aluminum, Inc., Torrance, Calif. $1,580,000. Detonating fuzes. Torrance. Frankford Arsenal, Philadelphia, Pa.

—Z. D. Products of Wells Marine, Inc., El Segundo, Calif. $1,104,040. Detonating fuzes. El Segundo. Frankford Arsenal, Philadelphia, Pa.

31—Hercules Powder Co., Wilmington, Del. $13,922,955. Loading, assembling and packing of miscellaneous propellants and explosives; and for operation and maintenance work. Radford Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Union Carbide Corp., New York City, N.Y. $1,100,146. Dry batteries for a portable radio receiver. Greenville, N.C. Army Electronics Command, Philadelphia, Pa.

—Quiller Construction Co., Los Angeles, Calif. $1,349,300. Construction of a one-story brick and stucco building at Norton AFB, Calif. Engineer Dist., Los Angeles, Calif.

—Southwide Construction Co., Augusta, Ga. $1,010,850. Construction of ranges at the Army Training Center, Fort Bragg, N.C. Engineer Dist., Savannah, Ga.

—Lawless and Alford, Inc., Austin, Tex. $4,465,013. Expansion of the Officer Candidate School at Fort Sill, Okla. Engineer Dist., Albuquerque, N.M.

—Bermite Powder Co., Saugus, Calif. $2,403,120. Fuze assemblies for 20mm cartridges. Saugus. Frankford Arsenal, Philadelphia, Pa.

—Fairchild Camera and Instrument Corp., Paramus, N.J. $7,800,000. Countermeasure sets and miscellaneous items. Paramus. Army Electronics Command, Philadelphia, Pa.

—Harvey Aluminum Co., Torrance, Calif. $1,738,000. 20mm projectiles. Torrance. Frankford Arsenal, Philadelphia, Pa.

—Progressive Construction Co., Farmville, Va. $1,979,991. Construction of two buildings and rehabilitation of 42 buildings at the Army Training Center, Fort Bragg, N.C. Engineer Dist., Savannah, Ga.

NAVY

1—Pacific Ship Repair, Inc., San Francisco, Calif. $1,276,000. Overhaul of the landing ship dock USS OAK HILL. San Francisco. Industrial Manager, 12th Naval District.

—Ira S. Bushey & Sons, Brooklyn, N.Y. $1,047,355. Regular overhaul of the auxiliary floating drydock (ARD-5). Brooklyn. Industrial Manager, 3rd Naval District.

—Stanwick Corp., Washington, D.C. $1,550,000. Development and evaluation of preventive maintenance standards for the Navy's Maintenance and Material Management System. $1,512,544. Development of techniques and systems design to permit analysis of reliability, maintainability and management data for the Navy's Maintenance and Material Management System. Washington, D.C. Naval Ship Systems Command.

2—Lockheed Missiles & Space Co., Sunnyvale, Calif. $4,000,000. Research and development on the Polaris missile re-entry system. Sunnyvale. Special Projects Office.

—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $92,898,600. TF30-P-8 engines for the Air Force. East Hartford. Naval Air Systems Command.

—General Electric, Schenectady, N.Y. $16,805,800. Research and development work in the field of naval nuclear propulsion. Schenectady. Naval Ship Systems Command.

3—Lockheed Missiles & Space Co., Sunnyvale, Calif. $21,600,000. Polaris A-3 missiles. Sunnyvale. Special Projects Office.

—Raytheon Co., Submarines Signal Div., Portsmouth, R.I. $1,769,770. Providing instruction, material, services and testing of sonar equipment. Portsmouth. Naval Ship Systems Command.

—General Electric, Schenectady, N.Y. $16,960,560. Furnishing of Navy nuclear propulsion components. Schenectady. Naval Ship Systems Command.

4—North American Aviation, Autonetics Div., Anaheim, Calif. $1,068,822. Ships Inertial Navigation Systems equipment. Anaheim. Naval Ship Systems Command.

—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $1,981,904. Spare parts for SH-3D aircraft. Stratford. Navy Aviation Supply Office, Philadelphia, Pa.

5—EDO Corp., Long Island, N.Y. $12,476,751. Sonar equipment. College Point, L.I., N.Y. Naval Ship Systems Command.

—United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $8,500,000. Increased funding for Phase II development of the TF-30-P-12 engine. East Hartford. Naval Air Systems Command.

—Sanders Associates, Inc., Nashua, N.H. $1,840,907. Continued basic engineering and development of an air droppable ASW sonobuoy system. Nashua. Naval Air Systems Command.

—Magnavox Co., Fort Wayne, Ind. $1,840,907. Continued basic engineering and development of an air droppable ASW sonobuoy system. Fort Wayne. Naval Air Systems Command.

—M. G. Allen & Associates, Warwick, R.I. $1,096,000. Construction of a 600-foot antenna at the Naval Radio Station, Newport, R.I. and at the Naval Radio Station, Tarlac, Philippine Islands. Northeast Div., Naval Facilities Engineering Command.

—Raytheon Co., Oxnard, Calif. $1,262,500. Services to fabricate and deliver turntable transmitters for the fire control system for the Sea Sparrow Project. Bedford, Mass. and Bristol, Tenn. Navy Purchasing Office, Los Angeles.

—United Aircraft, Sikorsky Div., Stratford, Conn. $9,117,850. CH-53A helicopters. Stratford. Naval Air Systems Command.

8—Westinghouse Electric, Pittsburgh, Pa. $29,754,191. Navy nuclear propulsion components. Pittsburgh. Naval Ship Systems Command.

—American Mfg. Co. of Texas, Fort Worth, Tex. $1,693,600. Mark 41 projectiles for 5" 54 caliber guns. Fort Worth. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—LTV Aerospace Corp., Dallas, Tex. $3,866,584. FY 67 procurement of A-7A Aircraft. Dallas. Naval Air Systems Command.

—Westinghouse Electric, Pittsburgh, Pa. $15,405,000. Research and development in the field of naval nuclear propulsion. West Mifflin Borough, Pa. Naval Ship Systems Command.

—General Electric, Washington, D.C. $1,020,000. To establish a training program for the Poseidon Weapon System. Pittsfield, Mass. Special Projects Office.

9—Norfolk Shipyard & Drydock Corp., Norfolk, Va. $1,805,333. Topside work involved in the regular overhaul of the oiler USS ELOKOMIN (AO-55). Norfolk. Industrial Manager, 5th Naval District.

—Grumman Aircraft Engineering Corp., Bethpage, L.I., N. Y. $12,400,000. Research and development model EA-6B aircraft. Bethpage. Naval Air Systems Command.

—McDonnell Aircraft, St. Louis, Mo. $430,000,000. Procurement of F-4B, F-4D, F-4E, F-4J and RF-4C aircraft. St. Louis. Naval Air Systems Command.

—Collins Radio Co., Cedar Rapids, Iowa. $2,493,421. Airborne UHF radio sets. Cedar Rapids. Naval Air Systems Command.

10—Dow Chemical Co., Midland, Mich. $2,090,550. Material for use in 2.75 inch rockets. Findlay, Ohio. Naval Propellant Plant, Indian Head, Md.

—United Aircraft, Pratt & Whitney Div., East Hartford, Conn. $1,284,453. Spare parts to support J52P6/A/8 engines on F9F and F8 aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.

—United Aircraft, Hamilton Standard Div., Windsor Locks, Conn. $2,680,871. Propeller system components for HC130H aircraft. Windsor Locks. Navy Aviation Supply Office, Philadelphia, Pa.

—Sunstrand Corp., Rockford, Ill. $10,438,860. Components for F-4 fighter aircraft. Rockford. Navy Purchasing Office, Washington, D.C.

11—Kaman Aircraft Corp., Bloomfield Conn. $3,397,500. Conversion of UH-2A/B helicopters to a twin engine configuration designated UH-2C plus related equipment. Bloomfield. Naval Air Systems Command.

—Straightline Mfg. Co., Cornwell Heights, Pa. $1,792,745. Fin assemblies for Mark 81 Mod 1 bombs. Cornwell Heights. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Mills Mfg. Corp., Asheville, N.C. $1,204,000. Parachute and container assemblies for Mark 24 flares. Asheville. Naval Ammunition Depot, Crane, Ind.

—Gibbs & Cox., New York City, N.Y. $1,807,731. Contract design plans and specifications for a guided missile destroyer. Washington, D.C. Naval Ship Systems Command.

12—General Electric, Schenectady, N.Y. $13,527,000. Furnishing of nuclear propulsion components. Schenectady. Naval Ship Systems Command.

—American Shipbuilding Co., Lorain, Ohio. $4,718,605. Conversion of a maritime hull to a minesweeper special. Lorain. Naval Ship Systems Command.

15—General Electric, West Lynn, Mass. $2,627,234. Spare parts for T58GE8B engines. West Lynn. Navy Aviation Supply Office, Philadelphia, Pa.

16—Sperry Rand Corp., Syosset, L.I., N.Y. $13,392,000. FY 67 technical assistance in the Polaris inertial navigation subsystem program. Syosset. Naval Ship Systems Command.

—Ryan Aeronautical Co., San Diego, Calif. $3,015,700. Firebee target drones. San Diego. Naval Air Systems Command.

—DeLaval Turbine, Inc., Trenton, N.J. $5,283,720. Multi-year procurement of steam turbine generator sets, associated equipment and engineering support services. Trenton. Naval Ship Systems Command.

—Beech Aircraft Corp., Wichita, Kan. $1,704,201. AQM-37A aerial targets. Wichita. Naval Air Systems Command.

17—Kelsey-Hayes Co., Philadelphia, Pa. $2,079,107. Warheads for 2.75-inch rockets. Philadelphia. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Sperry Rand Corp., Great Neck, L.I., N.Y. $8,945,321. Fire control radars for Terrier missiles. Great Neck. Naval Ordnance Systems Command.

—United Aircraft, Stratford, Conn. $3,500,000. Long lead time effort and materials for HH-53B helicopters. Stratford. Naval Air Systems Command.

18—Dell Industries, Waycross, Ga. $5,770,203. Spare parts for 500-pound bombs. Waycross. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—Newport News Shipbuilding & Drydock Co., Newport News, Va. $21,955,000. Construction of an attack cargo ship, $36,360,000. Construction of an amphibious force flagship. Newport News. Naval Ship Systems Command.

—Avondale Shipyards, New Orleans, La. $217,740,000. Construction of 20 ocean escort ships. New Orleans. Naval Ship Systems Command.

19—Ministry of Defence, Navy Dept., United Kingdom. $16,730,530. Construction of two surveying ships. Naval Ship Systems Command.

—Ministry of Defence, Navy Dept., United Kingdom. $7,354,850. Construction of a salvage tug. Naval Ship Systems Command.

—Northwest Marine Iron Works, Portland, Ore. $1,542,761. Modification and repair

of the missile range instrumentation ship USS WHEELING. Portland. Industrial Manager, 8th Naval District.

—**Vitro Corp. of America**, Silver Spring, Md. $1,458,250. Management services in connection with systems aboard surface ships. Silver Spring. Naval Ship Systems Command.

22 —**Reeves Instrument Co.**, Garden City, L.I., N.Y. $10,168,215. Components of the Mark 68 fire control system. Garden City. Navy Purchasing Office, Washington, D.C.

—**Farmers Tool & Supply Corp.**, Denver, Colo. $2,376,000. Components of nozzle and fin assemblies for 2.75-inch rockets. Denver. Navy Ships Parts Control Center, Mechanicsburg, Pa.

23 —**General Dynamics**, Pomona, Calif. $10,325,000. Work on the standard missile. Pomona. Naval Ordnance Systems Command.

—**Peterson Builders**, Sturgeon Bay, Wis. $2,282,825. Construction of six patrol motor gunboats. Sturgeon Bay. Naval Ship Systems Command.

24 **Boeing Co.**, Morton, Pa. $9,637,378 and $13,243,000. Spare parts and rotor blades for CH-46 and UH-46 helicopters. Morton. Navy Aviation Supply Office, Philadelphia, Pa.

25 **Aerojet General Corp.**, Sacramento, Calif. $1,203,600. Rocket motors. Sacramento. Naval Ordnance Systems Command.

LTV Aerospace Corp., Dallas, Tex. $1,142,655. Technical services and material to conduct aerial flights of target drones at Point Mugu, Calif. Naval Air Systems Command.

—**FMC Corp.**, San Jose, Calif. $2,645,124. Assembly and production of road wheels for LVTE1 amphibious vehicles. San Jose. Marine Corps.

26 **General Dynamics**, Pomona, Calif. $7,500,000. Research and development on the standard missile. Pomona. Naval Air Systems Command.

United Aircraft, Stratford, Conn. $11,000,000. Long lead time effort and materials for CH-53A helicopters for the Marine Corps. Stratford. Naval Air Systems Command.

—**Johns Hopkins University, Applied Physics Laboratory**, Silver Spring, Md. $21,087,960. Ordnance research. Silver Spring. Naval Ordnance Systems Command.

—**Rodale Electronics**, Garden City, N.Y. $1,364,734. Computers with weapon and aircraft adapters. Garden City. Naval Avionics Facility, Indianapolis, Ind.

Washington Aluminum Co., Baltimore, Md. $2,502,072. AM-2 mat assemblies for airfield matting. Enterprise, Ala. Naval Air Engineering Center, Philadelphia, Pa.

29 **Bendix Corp.**, Mishawaka, Ind. $1,418,000. Engineering and development program with associated production and tactical test equipment of the Talos missile. Mishawaka. Naval Ordnance Systems Command.

—**Southern Shipbuilding Corp.**, Slidell, La. $1,542,168. Construction of two landing craft, utility (LCU). Slidell. Naval Ship Systems Command.

30 **New York Shipbuilding Corp.**, Camden, N.J. $1,226,273. Regular overhaul of the store ship USS DENEBOLA (AF-56). Camden. Industrial Manager, 5th Naval District.

—**Pacific Ship Repair Co.**, San Francisco, Calif. $1,533,650. Overhaul work on the aircraft ferry USNS POINT CRUZ. San Francisco. Military Sea Transportation Service.

—**United Aircraft**, Windsor Locks, Conn. $4,000,000. Propeller systems for installation on P-3B aircraft. Windsor Locks. Navy Aviation Supply Office, Philadelphia, Pa.

—**Ward LaFrance Trucks Corp.**, Elmira Heights, N.Y. $1,094,700. Aircraft towing tractors. Elmira Heights. Navy Purchasing Office, Washington, D.C.

31 —**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $5,917,360. FY 66 procurement of A6A aircraft. Naval Air Systems Command.

—**Magnavox Co.**, Fort Wayne, Ind. $1,627,733. Design review, development, fabrication and test of preproduction models of an electronic countermeasure system; and to conduct liaison engineering for the program. Fort Wayne. Naval Air Systems Command.

—**Ratheon Co.**, Bedford, Mass. $1,707,178. Research and development on the Sparrow missile. Bedford. Naval Air Systems Command.

General Dynamics, Rochester, N.Y. $1,771,832. Components for aircraft radio receiver sets. Rochester. Navy Aviation Supply Office, Philadelphia, Pa.

Bethlehem Steel Co., Hoboken, N.J. $1,062,301. Regular overhaul of the ammunition ship USS GREAT SITKIN (AE-17). Hoboken. Industrial Manager, 3rd Naval District.

AIR FORCE

1 **RCA**, Princeton, N.J. $4,460,000. Production of communication and electronic components for space satellites. Princeton. Space Systems Div., (AFSC), Los Angeles, Calif.

Barnes Engineering Co., Stamford, Conn. $1,575,000. Production of horizon sensor radar systems. Stamford. Space Systems Div., (AFSC), Los Angeles, Calif.

3 **Fairchild Hiller Corp.**, St. Augustine, Fla. $1,570,578. Repair of C-119 aircraft. St. Augustine. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

United Aircraft, East Hartford, Conn. $2,880,101. Production of spare parts for the J-57 aircraft engine. East Hartford. Kelly AFB, Tex.

General Motors, Indianapolis, Ind. $6,551,101. Production of T-56 aircraft engines and related equipment. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Wichita, Kan. $1,036,657. Kits for B-52 wing and body structural modification. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

Curtiss Wright Corp., Wood-Ridge, N.J. $1,001,918. Overhaul of J-65 aircraft engines. Wood-Ridge. Kelly AFB, Tex.

4 **Northrop Corp.**, Anaheim, Calif. $3,500,000. Production of aircraft rocket warheads. Anaheim. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Hughes Aircraft, Culver City, Calif. $2,952,000. Work on an air-to-surface missile guidance program. Culver City. Systems Engineering Group, Wright-Patterson AFB, Ohio.

Aerodex, Inc., Miami, Fla. $2,427,105. Overhaul of J-57 aircraft engines. Miami. Kelly AFB, Tex.

IBM, Washington, D.C. $5,751,631. Purchase of leased computer systems, 2750th Air Base Wing, Wright-Patterson AFB, Ohio.

Thompson-Ramo-Wooldridge, Inc., Redondo Beach, Calif. $1,403,700. Work on a space program. Redondo Beach. Space Systems Div., (AFSC), Los Angeles.

Aerojet-General Corp., Sacramento, Calif. $2,000,000. Research, development and production of traditional stage III Minuteman III motors. Sacramento. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

5 **Aerojet-General Corp.**, Sacramento, Calif. $5,225,000. Overhaul, test and analytical services in support of the TITAN II propulsion engine system. Sacramento. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

Aviation Investments, Inc., Miami, Fla. $1,072,430. Inspection and repair of C-47 aircraft. Miami. Warner-Robins Air Materiel Area, (AFSC), Robins AFB, Ga.

—**General Motors**, Milwaukee, Wis. $1,300,000. Work on an inertial guidance system. Milwaukee. Space Systems Div., (AFSC), Los Angeles, Calif.

Magnavox Co., Fort Wayne, Ind. $1,297,112. Production of aircraft communication sets. Fort Wayne. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Sperry Rand Corp., Washington, D.C. $1,910,380. Computer systems. Utica, N.Y. Wright-Patterson AFB, Ohio.

Bendix Corp., Ann Arbor, Mich. $2,172,000. Production of a communication system. Ann Arbor. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

8 **American Bosch Arma Corp.**, Garden City, N.Y. $1,500,000. Support services for the Advanced Ballistic Reentry System program. Garden City. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

Cleveland Pneumatic Tool Co., Cleveland, Ohio. $1,567,128. Production of landing gear components for F-4 aircraft. Cleveland. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

Lear Siegler, Inc., Grand Rapids, Mich. $1,190,488. Aircraft navigation and bombing computer sets for F-4 aircraft. Grand Rapids. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

9 **Federal Electric Corp.**, Paramus, N.J. $2,905,176. Management and operation of the Air Force Western Test Range, Vandenberg AFB, Calif. Air Force Western Test Range.

General Precision, Inc., Pleasantville, N.Y. $1,613,048. Advanced manned strategic aircraft Doppler Radar Program. Pleasantville. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**North American Aviation, Inc.**, Anaheim, Calif. $1,625,000. Maintenance and modification of Minuteman missile guidance and control equipment. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

10 **Douglas Aircraft**, Santa Monica, Calif. $1,196,665. Procurement of Genie rocket motors. Rancho Cordova, Calif. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

General Dynamics, Convair Div., San Diego, Calif. $1,763,000. Launch services in support of Atlas-Agena Space programs. San Diego. Space Systems Div., (AFSC), Los Angeles, Calif.

11 **North American Aviation**, Los Angeles, Calif. $1,351,316. Modification of T-39 aircraft. Los Angeles. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

Sanders Associates, Nashua, N.H. $1,363,701. Production of airborne radio direction finding equipment. Nashua. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

United Aircraft, East Hartford, Conn. $3,761,655. Spare parts for J-57 aircraft engines. East Hartford. Kelly AFB, Tex.

12 **North American Aviation, Autonetics Div.**, Anaheim, Calif. $10,264,000. Design and development of post-launch control systems for the Minuteman Missile. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

B. F. Goodrich Co., Akron, Ohio. $1,402,790. Procurement of F-4 aircraft tires. Akron. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

Douglas Aircraft, Long Beach, Calif. $1,011,000. To conduct fatigue tests on C-124 aircraft. Long Beach. Warner Robins Air Materiel Area (AFLC), Robins AFB, Ga.

Raytheon Co., Bedford, Mass. $1,400,000. Work on an advanced airborne overland radar system. Bedford. Research and Technology Div., Wright-Patterson AFB, Ohio.

General Motors, Indianapolis, Ind. $1,439,523. Procurement of turbine blades for T-56 engines. Indianapolis. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

15 **Aerojet-General Corp.**, Sacramento, Calif. $1,100,000. Design of an advanced post launch propulsion system for ballistic missiles. Sacramento. Air Force Flight Test Center, (AFSC), Edwards AFB, Calif.

16 **Gary Aircraft Corp.**, San Antonio, Tex. $1,662,202. Overhaul of Peckelle Aerospace Ground Equipment Engines and related parts and accessories. Hondo, Tex. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

General Dynamics, San Diego, Calif. $5,723,075. Work on design and development of a standard space launch vehicle. San Diego. Space Systems Div., (AFSC), Los Angeles, Calif.

Hercules, Inc., Wilmington, Del. $20,313,000. Production of Stage III motors for Minuteman II missiles. Magna, Utah. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

17 **Aero Corp.**, Lake City, Fla. $3,225,000. Inspection and repair of C-124 aircraft. Lake City. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Systems Development Corp.**, Santa Monica, Calif. $1,400,000. Research and laboratory work on information processing techniques program. Santa Monica. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

18 **North American Aviation**, Los Angeles, Calif. $1,000,000. Engineering, technical and support services for the X-15 research aircraft program. Los Angeles. Aeronau-

tical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

9—Motorola, Inc., Scottsdale, Ariz. $1,137,600. X-band communication sets. Scottsdale. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Boeing Co., Wichita, Kan. $4,100,000. Modification kits for B-52 aircraft. Wichita. Oklahoma City ir Materiel Area, (AFLC), Tinker AFB, Okla.

—B. F. Goodrich Co., Akron, Ohio. $1,720,510. Tire tubes for C-130 aircraft. Akron. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—Hayer International Corp., Birmingham, Ala. $4,758,438. Inspection and repair as necessary of C-124 aircraft. Birmingham. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—United Aircraft, East Hartford, Conn. $1,473,620. Production of components for J-57, T-34 and TF-33 aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

22—Boeing Co., Seattle, Wash. $50,824,000. Production of Minuteman II missiles and related equipment. Seattle. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—General Motors, Indianapolis, Ind. $1,261,214. Turbine blades for T-56 engines. Indianapolis. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—United Aircraft, East Hartford, Conn. $2,033,490. Production of aircraft engine components. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—Cessna Aircraft, Wichita, Kan. $3,500,000. Modification of T-37 aircraft to AT-37 configuration. Wichita. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

23—United Aircraft, East Hartford, Conn. $1,107,487. Production of spare parts for the J-57 aircraft engine. East Hartford. San Antonio Air Materiel Aven, (AFLC), Kelly AFB, Tex.

—Boeing Co., Wichita, Kan. $2,681,444. FY 67 engineering and support services for the B-52 fleet. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Hughes Aircraft, Fullerton, Calif. $1,200,000. Development of overland radar techniques. Fullerton. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

24—M.I.T., Cambridge, Mass. $1,200,000. Work on an advanced sensor program. Cambridge, Systems Engineering Group, (AFSC), Wright-Patterson, AFB, Ohio.

—M.I.T., Cambridge, Mass. $28,790,000. Research and development on advanced electronic programs. Lexington, Mass. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

25—United Aircraft, Windsor Locks, Conn. $1,581,957. Overhaul and modification of aircraft propellers. East Granby, Conn. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

26—Analytical Services, Inc., Falls Church, Va. $1,340,000. Analytical studies pertaining to the application of weapons systems. Falls Church. Air Force Office of Scientific Research.

—Continental Aviation and Engineering Corp., Detroit, Mich. $1,050,000. Work on an advanced turbine gas generator program. Detroit. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

30—System Development Corp., Santa Monica, Calif. $14,696,032. Design and development of electronic information and communications equipment. Santa Monica. Electronic Systems Div., (AFSO), L. G. Hanscom Field, Mass.

—Hughes Aircraft, Culver City, Calif. $16,786,006. Conversion of AIM-4C to AIM-4D (Falcon) aircraft missiles. Tucson, Ariz. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—Stewart & Stevenson Services, Inc., Houston, Tex. $1,281,423. Production of heavy duty electrical generators. Houston, Tex. Sacramento Air Materiel Area, (AFLC), Kelly AFB, Tex.

31—United Aircraft, East Hartford, Conn. $1,516,318. Production of components for J-57 and T-34 aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly FB, Tex.

—The City of Grand Forks, N.D. $1,730,000. Increased water supply at Grand Forks AFB, N.D. Grand Forks AFB Procurement Office.

USAF Invites 15 Firms To Submit Proposals for Computer Systems

Fifteen computer manufacturers have been invited by the Electronic Systems Div., Air Force Systems Command, L. G. Hanscom Field, Mass., to submit proposals for installing 100 to 160 electronic data processing systems at Air Force bases throughout the world.

The firms were given until Nov. 30 to submit their proposals to the Electronic Data Processing (EDP) Equipment Office at Electronic Systems Div., in what is expected to be the largest single acquisition of commercially available computers ever undertaken.

The equipment represents the second phase of the Base Level Data Automation Standardization Program.

Colonel S. P. Steffes, head of the EDP Equipment Office, has suggested that small business firms, or others interested in sub-contracting opportunities in connection with this program, make direct contact with the firms invited to submit proposals.

The fifteen invited companies are: Burroughs Corps., Collins Radio, Computer Control Co., Control Data Corp., Friden Inc., General Electric, General Precision, Honeywell, I.B.M., Lear-Siegler, National Cash Register, Philco, R.C.A., Scientific Data Systems and Sperry Rand.

Evaluation of proposals and selection will be done according to standard Air Force selection procedures. Acquisition of equipment will be made under existing General Service Administration schedules.

New Security Manual Available to Industry

The latest edition of the Industrial Security Manual for Safeguarding Classified Information (ISM) has been distributed by the Defense Supply Agency and is now available for purchase.

Copies of the new manual can be ordered from the U.S. Government Printing Office, Washington, D.C., 20402 for $1.50. Order by Catalog Number: D3.6/3:SE 2/966.

The manual establishes uniform security practices within industrial plants or education institutions and all organizations and facilities used by prime and subcontractors having classified information of the Defense Department.

Because of the variety and scope of revisions, a resume of the changes has been prepared as an introduction to the new manual.

Contractors should begin revising their Standard Practice Procedures (SPP) so that the revised SPP will reach the cognizant security office by November 1966.

Nuclear Vulnerability Assessment Responsibility Assigned to AFSWC

Responsibility for assessing the vulnerability of operational weapon systems to the effects of nuclear explosions has been assigned to the Air Force Special Weapons Center (AFSWC) at Kirtland AFB, N. M., by the Air Force Systems Command. The center, commanded by Colonel Ralph S. Garman, has conducted laboratory and field tests to simulate the effects of nuclear explosions for several years.

A new office has been established under the center's Deputy for Test and Engineering. This office will analyze and, if necessary, test under simulated conditions the ability of operational Air Force aircraft and missiles to survive and operate in wartime nuclear environments. It will conduct vulnerability assessments on a continuous basis in light of new nuclear effects knowledge gained from underground tests, theoretical studies and effects simulation tests.

The Systems Command's Air Force Weapons Laboratory, also located at Kirtland AFB, will continue its development of new simulation techniques for AFSWC and will support the center with effects data and computer services.

Contractor's Training Guide Available

A publication titled, "Contractor's Training Manual," which is a sectionalized compilation of the individual specialized training requirements of the Army, Navy, Air Force and the National Aeronautics and Space Administration, has been released by the Aerospace Industries Association (AIA). It was prepared by task groups of industry training management specialists under the cognizance of the AIA Product Support Committee.

The manual is a complete set of guidelines, in one volume, from which the criteria governing hardware and personnel training requirements can be established. It can aid in the preparation of training proposals, and it can be of particular assistance in the final formation of complete training programs.

It is intended that the manual will benefit all organizations, both large and small, including the experienced contractor who may find it necessary to reorient his organization to a new customer and a changed requirement that is beyond his existing experience.

Copies of the manual, in limited quantities, are available at $5.00 each. Requests should be forwarded to:

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Military Kept Moving During Airline Strike by MTMTS/Labor Cooperation

When five major airlines were idled by a strike July 8, knocking out more than 60 percent of the nation's air-passenger capacity, movement of military personnel had to go right on, uninterrupted.

For the Armed Forces it was a particularly bad time for a transportation tieup. In addition to normal traffic, thousands of reservists were on the move in connection with annual two-week summer training sessions. Since arrangements are made well in advance of movement dates, much administrative reshuffling was needed.

With no added personnel, the Military Traffic Management and Terminal Service (MTMTS) began 24-hour operations in an attempt to resolve the problem.

About July 1, actions were taken to reroute Defense group-movements scheduled on the affected airlines for July 6, 7 and 8—the 6th being the earliest date the strike could legally be called.

On July 5, Major General John J. Lane, MTMTS commander, alerted his nationwide command, and the Military Services, for carrying out the terms of the emergency transportation plan.

A member of his staff, meanwhile, met with representatives of the Secretary of Defense to prepare memoranda which described the impact of the strike on national defense, and the means by which remaining commercial transportation could be used.

MTMTS gained a concession from the striking union whereby charters within the continental United States would be permitted to operate for essential military traffic. This would accommodate about 30,000 military passengers a month who ordinarily would use the affected lines.

Throughout the strike MTMTS worked closely with the Air Transport Association and other groups from the industry. All group-movement personnel scheduled on the five struck carriers were rerouted and moved without delay. Local transportation officers rounded up individuals and small groups and consolidated them into groups of 15 or more, thereby enabling MTMTS to charter flights. This action prevented individual military travelers from being stranded while journeying to new duty assignments or home on leave. Consolidation efforts by MTMTS and the cooperation of the striking union solved the problem thereby averting a situation which could have been detrimental to national defense.

Navy Aquanauts Get Permanent Home in San Diego

A permanent home port and training facilities for Navy aquanauts assigned to the Man-in-the-Sea program has been activated in San Diego, Calif.

The aquanaut base, called the Deep Submergence Systems Project Technical Office (DSS PTO), is located at the Submarine Support Facility, Ballast Point, San Diego.

The technical office provides curricula, schedules and facilities for training Navy aquanauts. In addition, the new office will furnish engineering, research, testing and technical services for specific Navy operational requirements, and give assistance during implementation of ocean engineering experiments involving performance evaluation of ocean engineering hardware, such as diving suits and air breathing equipment for divers.

It is estimated that complete diver training in all aspects of advanced diving techniques will be available at the new office in about 18 months.

Capt. Walter F. Mazzone, MC, who served as physiological control officer during both of the Navy's SEALAB experiments, has been named Officer-in-Charge of the new aquanaut center. The office will be staffed by 15 officers and 43 enlisted men.

DEFENSE INDUSTRY BULLETIN

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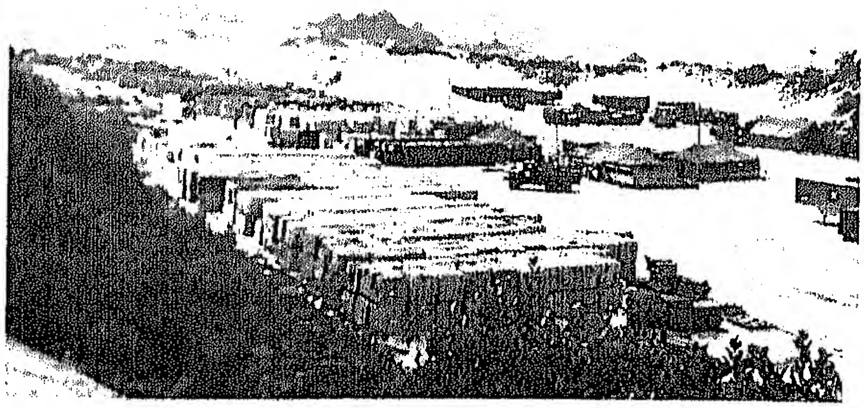
IN THIS ISSUE

DEPARTMENTS

DEPARTMENT OF DEFENSE

ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

Logistics in Vietnam



"This conflict will take the best we have—the finest men and the equipment best suited for the job—and to do it also takes the best logistic system in the world. . . . About a million different kinds of items are needed to supply our Army today. . . All these items must be designed, tested, manufactured, packed and shipped to a water port in-country and, finally, delivered to the men at the triggers of the weapons—and many of the vital links in the logistics chain are civilian industrial links not military ones." —Lieutenant General L. J. Lincoln, USA, Deputy Chief of Staff for Logistics, U. S. Army.

See article, "American Industry and the Logistic Bridge to Our Fighting Man," beginning on page 1.

Deadlines for Christmas Gifts Sent Overseas Announced

To insure prompt delivery of Christmas gifts sent to servicemen stationed overseas, the Post Office Department urges that all packages sent by regular postage be mailed by November 10 and all air mail parcels be sent no later than December 10.

Parcels addressed to servicemen in Vietnam that weigh no more than five pounds and measure no more than 60 inches in length and girth combined may be mailed at the ordinary postage rate and be transported by air on a space-available basis between San Francisco and Vietnam.

There are at present no plans for a special Defense Department airlift of bulk collections of Christmas gifts for servicemen this year.

The Post Office Department cautions that gifts should be securely packed in cartons of wood, metal, or double-faced corrugated fiber board and that fragile items be surrounded by cushioning materials such as excelsior or shredded paper.

Matches, lighter fluid and similar flammable items are prohibited from the mails. Check with your local post office for details of these and other restrictions as well as size and weight limitations applicable to mail destined for certain geographic areas.

To insure the safe arrival of gifts, packages should be wrapped securely and the addresses written correctly and legibly using the appropriate five-digit APO or FPO number as part of the address. As an added assurance, place a duplicate label, which plainly shows both the addressee and the return address, inside the package.

Mail intended for an unspecified addressee will not be accepted. Mail for servicemen must be addressed to a named individual or to a specific military unit.

DEFENSE INDUSTRY BULLETIN

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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American Industry and the Logistic Bridge to Our Fighting Man

The following is taken from a briefing for representatives of business and industry given by Lieutenant General L. J. Lincoln, USA, Deputy Chief of Staff for Logistics, U. S. Army.

Through nine major wars and countless minor actions the industry-military team has functioned in support of our national policy and national defense. We in the Department of Defense are conscious of the tremendous and vital contributions to our past victories that the industry half of the team has made.

Today our military strength, backed by the producers of this nation, is committed, with other free world forces, in still another war. To the soldier it is just that—war, whether or not it is a declared one—a dirty war, fought under the hazards of constant heat, drenching monsoons, or gritty dust against an almost unseen enemy who has 20 years of conflict behind him. It is the third war for this generation of Americans. This conflict will take the best we have—the finest men and the equipment best suited for the job—and to do it also takes the best logistical system in the world.

Logistics has long been a science and is becoming to some extent an art in the modern world. The requirements to support our forces on a world-wide scale become staggering and resolve themselves into military demands on our economy—all facets of the economy. The job of supplying a rifleman in a paddy field, or in a field of elephant grass almost 9,000 miles away from the production base, makes great demands on logistical enterprise. This enterprise is by no means a purely military one. About a million different kinds of items are needed to supply our Army today to include those who are fighting in the deltas and highlands of Vietnam. About half of these items are procured by the Defense Supply Agency. All these items must be designed, tested, manufactured, packed and shipped to a water port or airfield in-country and, finally, delivered to the men at the triggers of the weapons—and many of the vital links in the logistic chain are civilian industrial links, not military ones. Thousands of contractors all over the United States are deeply involved in the various elements I've mentioned. I don't mean to imply that American industry is not frequently located close to the troops it supports. American industry is in range of Viet-Cong guns in Southeast Asia today. I received a letter from a civilian friend who works for an American contractor in Vietnam who is constantly with in range and subjected to Viet Cong fire. However, there is a military logistic bridge even there. Military logistics must plan, budget, contract and administer.

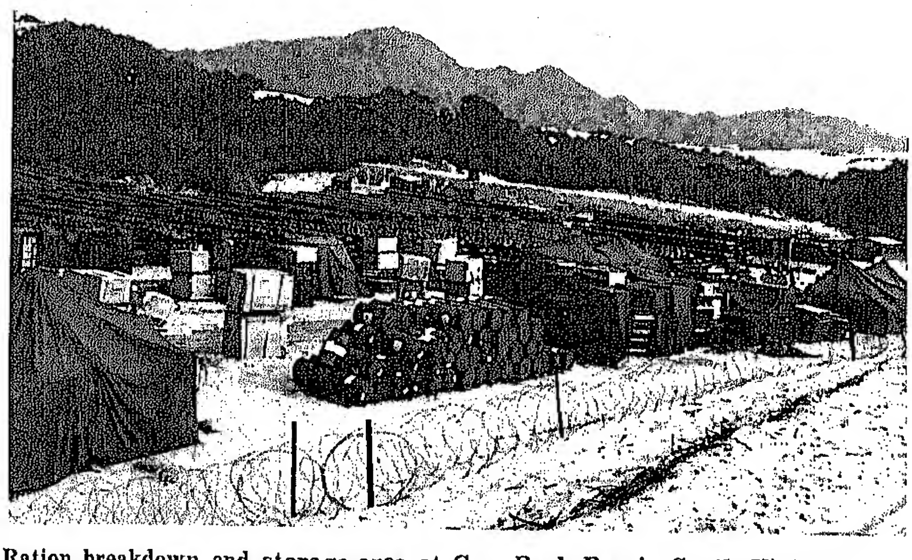
I said we depend on industry and you may well ask how. I'll mention some of the ways we depend on you—the business men of American industry.

We depend on you to produce the best possible product at the most reasonable cost, thus providing a major part of the base for our military power. In such production, we would expect you to apply the principles of human engineering, systems analysis and the most modern techniques the state of the art will allow, no matter what the product or service. While a competitive market normally promotes such practices, we seek a special effort for reasons of economy of the taxpayer's dollar, quality and utility of the product and reduction of lead times. The soldier at the front is affected.

It may sound like a platitude or I may sound like a contracting officer, but we really do depend on you to meet scheduled production dates and quantities. Late deliveries cause us problems that extend far beyond the technicalities of contract performance and cause us problems in our combat operations. We have some items that are now badly needed in Vietnam wherein the contract is over a year behind scheduled deliveries.

We depend on you to develop and apply packaging that is most resistant to damage, heat, humidity, shock and, in the case of Vietnam, ten thousand miles of traveling followed by prolonged exposure to monsoon weather, dust and the roughest of handling.

We are dependent on industry to furnish an ever increasing amount of supporting contractual services in Vietnam.



Ration breakdown and storage area at Cam Ranh Bay in South Vietnam.

Those are some of the major ways in which those at the far end of the logistic bridge must rely on U.S. industry. It is military logistics that links this vast industrial machine to our fighting forces. Perhaps I should say "business," since the term industry, to many people, creates visions of great industrial complexes like General Motors or U.S. Steel. We do depend on them, but we are just as deeply indebted to thousands of smaller businesses who furnish components as well as end items.

The logistic bridge I've described is relatively broad and smooth at this end, mostly due to the years of our successful team effort, but at the far end—the one in Vietnam—conditions make it rough.

I'd like to talk about some of these rough aspects, since they relate directly with the ways in which the Army depends on you.

Before our buildup began, the port of Saigon, crowded and behind the times as to methods, was inadequate to meet the discharge requirements. It was really the only port in South Vietnam. The terrific increase in shipping required the United States to build new ports—six of them—to support the new troop strength. This was in addition to extensive expansion in Saigon itself. A tremendous effort by Army engineer units, the Navy Seabee units, as well as civilian contractors, both U.S. and allied, plus extensive use of lighterage and increasing use of De Long-type piers, has resulted in port facilities now keeping pace with the military requirement. However, much remains to be done. There is a related problem in capacity for handling cargo for non-military purposes. This non-military cargo often becomes quite important, but is not normally handled by military facilities.

The climate in Vietnam, you might say, runs the gamut from bad to worse—if it's not monsoon rains in the lowlands, it's foot-deep dust in the highlands. This puts terrific strain on equipment, most of which has to be operated across the whole range of adverse conditions on a practically 24-hour-day basis when combat operations are under way. The same conditions affect textile products such as uniforms and tents. I'm told that the threads used to stitch our standard combat boot can disintegrate in a matter of days. We are, therefore, furnishing our new jungle boot as rapidly as possible. It has a sole moulded rather than stitched to the uppers. This is what I referred to when I said we depend on you to provide equipment that can stand up to this sort of weather and terrain.

Today's combat in Vietnam requires large tonnages of bombs, bullets, rations and, in all, perhaps a million items. It aggregates now over 300,000 short tons a month of which about two percent move by air.

In the ultimate, the war there is not one of tons and statistics, but rather is one of close combat. The individual soldier has the lonely and hazardous task of finding the elusive enemy and defeating him. He must seek him out in the deep jungles and hidden tunnel complexes. He must destroy the enemy's weapons, factories, food and equipment that he finds there. He must face an enemy that in 1960 consisted largely of guerrilla squads, but today consist of organized regiments. Our own forces have built up with this increasing threat. In the end the military control that we seek is not achieved by tons of supplies, but by the courage and readiness of that soldier to face the enemy and defeat him. Our logistic bridge to support him, however, is a vital link and without it he will be helpless. It is over 10 days sailing from the west coast. There is also the lead time in the procurement and production phases. We must today start on things needed a year from now. The fighting man's rations, shelter, equipment and ammunition a year from now are all dependent on what we are doing today.

Problems in our production base back here can cause even more serious problems for the soldier at the front if they do not produce the needed

(Continued on Page 35)

An Army UH-1B helicopter lands supplies at isolated outpost in South Vietnam

A Self-Appraisal for Project Managers

by

Lt. Col. James Bain Jr., USA

Galileo said, "You can't teach a man anything; you can only help him find it in himself." An objective appraisal of your performance can help you find, in yourself, a better project manager.

Students from Government and industry at the Defense Weapon Systems Management Center (DWSMC) learn to be better program managers by objective evaluation of their deficiencies. Sincere requests for criticism from fellow students are usually rewarded by disturbingly frank comments. This leads to improvement. In this process, the instructor serves as a catalyst to accelerate the free exchange of constructive criticism.

It seems that most students are deficient in their balanced emphasis, rather than the development, of skills. Many students selected to attend DWSMC, a DOD-sponsored school for major weapon system program management, have already developed the skills required. In practice situations confronting a program manager, most students consistently and unconsciously over-emphasize certain skills and neglect others. A project manager who is qualified, but who neglects some skills, has the same impact on the organization as one who is unqualified. The important difference is that one with ability can easily improve by placing equal emphasis on neglected skills. Most students, however, are unaware of their neglect until class discussions help them realize it.

Practicing project managers may also be deficient in their balanced emphasis of skills, yet be totally unaware of it. Most program managers, and particularly those with higher education, feel they do a good—if not excellent—job of managing a project. Because people are so easily offended when criticized outside of an academic environment, other people hesitate to tell them what they really think of their managing efforts. This strengthens their illusions. Consequently, some program managers fail to improve with practice.

Improvement is possible, but it must begin with objective self-appraisal. A practicing project manager does not have advantage of "academic immunity." A student can "run the world" as often as necessary to learn from appraisal of his mistakes. A practitioner can only "run the world" once, and usually without the benefit of constructive criticism. This forces him to find it in himself to improve by objective self-appraisal.

The purpose of this article is to identify the neglected skills of student project managers to help practicing project managers evaluate their own performance.

The approach describes the skills that a good project manager emphasizes and a poor project manager neglects. The impact of each is compared, because an organization reflects a true image of the project manager's performance Finally, four action steps to become a better program manager are outlined.

Functions and Skills of a Good Project Manager.

A good project manager performs three separate, yet interrelated functions, namely, executive, management and leadership. The executive function determines objectives, policies and programs to produce a weapon system on time, within cost, and with the required reliability and performance. Management controls performance, schedule and cost to accomplish established programs. Leadership promotes essential contributions from individuals.

Executive Function and Skills. The executive function involves decision making to regulate the relations among desired objectives, available means of the organization, and limiting factors of the situation. Possible objectives desired by the decision maker are determined. Courses of action which have some chance of yielding desired objectives by employing available means are also determined. Each feasible course of action is then analyzed to determine its probable outcome in an anticipated, or estimated, situation. All factors which can affect the outcome, and which are not under the decision maker's control, should be considered. These steps may result in a decision not to decide.

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Emerging from this decision process may be an operating policy or program which must be complete and understandable before management can begin. A program specifies what objectives must be accomplished, in what period, and with what organizational means. Policy specifies the organization structure to carry out the programs and the limits of action by immediate subordinates. It is essential that policies and programs be related and compatible.

The executive function requires the skills of innovating objectives, policies and programs; anticipating all factors of the situation; and organizing means to be generated and allocated. More intuition than knowledge is involved because of conditions of uncertainty. Much of the expected value of decisions and their probable outcomes are only intuitively known by the decision maker. There is much that is not susceptible to either quantitative or qualitative statement. Students at DWSMC felt that the executive skills of the program manager approximate 80 percent intuition or arts; and 20 percent knowledge or science.

A good project manager jealously guards his prerogative to make decisions which must be interrelated, and which will affect the whole. He alone sees the whole and must decide pertinent policies and programs. Even his deputy is not permitted to make such decisions without express permission. He continually adjusts his policies and programs to prevent deterioration with the passage of time. He avoids abrupt adjustments based upon periodic reviews. He is careful not to decide questions others should decide. His policies and programs are primarily designed to answer important questions, which permits further refinement by lower levels. Most important, he considers the time lag between decision and action.

Management Function and Skills. The management function involves problem solving to control the relations among the work to be accomplished, the schedule of accomplishment, the cost resources and the budget. Management problems respond to measurement, calculation and standardized action. They are characterized by repetitive solutions and recurring situations. A problem exists whenever there is inequality among the elements of a simple management equation. Solving the problem requires changes in the work, cost, schedule, or budget to rebalance the management equation which is expressed as follows:

$$\frac{\text{Work}}{\text{Time Period}} = \frac{\text{Cost}}{\text{Time Period}} = \frac{\text{Budget}}{\text{Time Period}}$$

The management function requires skillful programming, costing and budgeting. More knowledge than intuition is involved because of conditions of certainty and risk. The expected values of work, cost and schedule can usually be determined, and the possible outcomes occur with known probabilities. The criteria of choice is maximization of expected value. Techniques and procedures describing the applications of these skills comprise the bulk of existing literature on project management. DWSMC students felt that the management skills approximate 80 percent knowledge or sciences; and 20 percent intuition or art.

Management problem solving is extensively delegated to organizational levels by means of an integrated programming-costing-budgeting-reporting system. Programming progressively divides and distributes responsibility for accomplishing program tasks. Costing attempts to express required resources in terms of a common denominator, the dollar. Budgeting progressively divides and distributes the authority to spend those dollars. Reporting continuously accumulates data on performance, cost, schedule and budget to assess the status and forecast the balance of the management equation. Each level has the responsibility for balancing its equation and solving problems within its authority. If a level cannot balance the management equation, the problem is an exception which must be reported to the next higher level.

A good project manager provides every protection possible to this management delegation process. He establishes and maintains a single system to insure delegation of commensurate responsibility, authority and information to solve problems. He attempts to solve only those exceptions referred to him by his immediate subordinates, but he continually monitors the delegation process by balancing his top level management equation. He establishes thresholds to provide a zone of authority to the lower levels, thereby reducing exceptions. He divides problem solving between his deputy and himself so he can concentrate on critical problems. Finally, he makes use of powerful quantitative techniques. Mathematical models are developed and refined to help determine effects of change and optimal solutions to complex problems.

Leadership Function and Skills. Leadership involves three conditions that must exist simultaneously before a subordinate can contribute. The individual must understand what to do, he must be capable of doing it, and he must be willing to do it. Leadership is a personal relationship between two individuals—the leader and the led. Inherent in each individual led is a different and changing set of conditions, i.e., understanding, willingness and capability. For this reason leadership is also a temporal relationship.

Leadership of individuals requires communicating to increase understanding, training to increase capability, and motivating to increase willingness. Leadership skills, like executive skills, are accomplished more by using intuition than knowledge. Empathy with individuals is the most valuable asset a leader can have, i.e., sensitivity to their response to him. DWSMC students felt that the leadership skills of the project manager approximate 80 percent intuition or art; and 20 percent knowledge or science.

Balanced Emphasis. Why do some project managers achieve satisfaction and accomplishment, while others fail? The answer lies in one magic, mysterious ability balanced emphasis. Balanced emphasis on the equally important executive, management and leadership functions and skills is the secret of success.

Balanced emphasis results in the most effectiveness for the least effort by the project manager. Odd as it may seem, a good project manager needs only average ability in all necessary functions and skills, if he can balance them.

Functions and Skills of a Poor Project Manager.

A poor project manager overemphasizes management and neglects the equally important executive and leadership skills. He has lost his balance by seriously misjudging the relative importance of management, which is known and described by a wealth of literature. The executive and leadership functions cannot be so easily described and little literature exists. They are mostly intuitive in nature.

While the increasing complexity of project work demands better management techniques, it also necessitates better executive and leadership ski to support them. One should not jud the importance of skills by the poun of literature produced. It's sheer fol to let this criterion be the reason f neglecting executive and leadersh skills in practice.

Neglected Executive Skills. A po project manager neglects the exec tive skills of innovating and antic pating. He reacts to the present situ tion and existing directives more tha he anticipates future situations an innovates realistic objectives. H highest executive responsibility c creativity has reverted to nothing bu responsiveness, when he reacts.

The cause of this neglect is pri marily the elaborate channels of co ordination and decision through whicl changes must be staffed for approval The continuing growth of staff agen cies in both size and number i modern organizations results in dis persal of authority which is exercise without responsibility. This seriously limits the project manager's flexibility to innovate and anticipate change. He is forced to justify changes by resorting to reasoning which appears rational and appeals to specialized staff agencies. This is an extraordinary feat of salesmanship which would stagger and crush the best of men considering the many different specializations and levels of those that must be persuaded.

Dilemmas which result from complex decision-making structures imply at least one of the following. First, a project manager can choose to react and accept the consequences of not innovating and anticipating. Second, a

IMPACT OF EXECUTIVE EMPHASIS UPON THE ORGANIZATION

POOR PROJECT MANAGER	GOOD PROJECT MANAGER
OBJECTIVES, POLICY & PLANS	
—Unrealistic and Deterministic	—Realistic and Dynamic
—People Know But Don't Believe and Can't Achieve	—People Know, Believe & Achieve
ORGANIZATION ORDER	
—Crisis, Panic and Crash Action	—Urgent, Expedited and Unified Action
—Work Done and Redone	—Work Done Once
—Deadlines Missed and Policy Violated	—Deadlines Met Within Policy
—Routine Actions Suspended	—Routine Action Continued
PERFORMANCE OF PEOPLE	
—Few Key People Involved Doing Work For Long Hours	—Few Key People Available for Guidance and Decisions
—Working Levels Keep Busy Doing What They Want	—Working Levels Kept Busy Doing What Is Necessary
—Responsibility Usurped by Crisis	—Responsibility Delegated Thru Channels
PERFORMANCE OF PROJECT MANAGER	
—Always Too Busy Fighting Fires	—Never Too Busy To Fight Fires
—Forced To Make Routine Decisions For Lack of Policy and Thresholds	—Uses Policy and Thresholds To Force Routine Decisions By Organization

Figure 1.

project manager can choose to innovate or anticipate, and accept the consequences of his initiative, i.e., persuading the specialized staff.

Some project managers choose to follow the first course because it is easier and avoids "making waves." They have not developed a talent for persuasion on the scale required. They prefer to accept the risk of not innovating or anticipating rather than the risk of failing to persuade higher levels. Included in this group are some project managers who have been worn down by frustration.

Other project managers follow the second course of action and accept the penalty for innovating or anticipating. They have a talent for persuasion but must spend considerable time and effort in its accomplishment. Persuasion results at best in delay and at worst in disapproval. They are willing to pay this price to insure that their objective, policies and programs are as realistic as possible under the circumstances.

The impact of neglecting executive skills is the same whether caused by the project manager or the conditions imposed upon him. Neglecting to anticipate and innovate results in setting unrealistic objectives, policies and programs. People can never believe in, nor achieve, unrealistic objectives.

Without realistic objectives, there is no unity of organized effort. People either do what they think they should, or do nothing. Without a unifying purpose, people naturally align their actions to satisfy their own interests and motives.

Figure 1 summarizes the impact of executive emphasis upon the organization.

Overemphasized Management Skills. A poor project manager overemphasizes his role in the management function by doing or approving problem solving delegated to subordinate levels. He does his subordinates' problem solving in the work he knows. He holds confirming reviews to approve his subordinates' solutions in the work he does not know. Again, his emphasis is upon skills requiring more knowledge than intuition.

This overemphasis is caused by the poor project manager being over-interested in work he knows, and over-cautious about work he does not know. But when he gets to the problem solving of lower levels, he usurps the responsibility and authority which he has delegated.

Probably the most vivid description of what happens to the organization as a result of these two management failings is "the poor project manager is very busy moving around the furniture in his house while the house is on fire." He gets so busy, he lets his own management function go and he can never find the time to perform executive and leadership functions.

There is another sure indication of these failings. Two separate management information systems are created —one for the poor project manager himself and an "eyewash" system for his organization. Because the poor project manager attempts to solve and approve all problems himself, he necessarily needs a great deal of information. He usually obtains this information by an informal system of reporting and by extensive traveling to "get the facts."

Another serious impact upon the organization is indecisiveness and a diminution of a general sense of responsibility in his people. This stems from an apparent lack of confidence in their problem solving. Because of this lack of confidence, people redelegate their responsibility and authority back to the project manager.

Figure 2 summarizes the impact of the management emphasis upon the organization.

Neglected Leadership Skills. A poor project manager gets caught in the trap of attempting to manage rather than lead people. He fails to communicate and motivate. He becomes more authoritative than communicative, and he relies more on material incentives than moral persuasion.

Neglect of these skills in practice is caused by assuming people are not willing to contribute. This assumption leads him to blame people. He, then, attempts to use his authority by demanding their participation. Material incentives are used to regard those willing to conform and those who are unwilling are punished.

A poor project manager is unaware that his communication skills are to blame rather than his people. His people simply do not understand what he wants. He writes and talks, but seldom informs. He hears, but seldom listens. He sees, but seldom has time to read. He consistently under-estimates the intelligence and over-estimates the information of his people. They, in turn, consistently over-estimate his intelligence and under-estimate his information. He pays little attention to improving oral communications in the organization such as daily staff meetings, telephone contacts, conferences, briefings, etc.

His usual habit of blaming people severely limits his skill in moral persuasion. People do not believe his reform measures are important and they are not motivated to succeed. His negative attitudes are apparent to all. He is cynical, critical, impatient, and sees mostly the bad side of people. His attitudes reflect his feeling that his people will fail, and they do.

The impact of these neglected skills upon the organization is deliberate withholding of information. His failure to communicate and motivate results in frustration among his staff. Subconsciously, people will defend against frustration by withholding some of what they contribute, i.e., information. The project manager has no way of measuring the loss of an idea that could have been contributed; however, he senses that it is happen-

IMPACT OF MANAGEMENT EMPHASIS UPON THE ORGANIZATION

POOR PROJECT MANAGER	GOOD PROJECT MANAGER
MANAGEMENT PROBLEM SOLVING	
—Does Subordinate Problem Solving In Work He Knows	—Does His Own Problem Solving At Level For Which He is Responsible
—"Approves" Subordinates Problem Solutions In Work He Does Not Know	—Delegates Problem-Solving Responsibility Within His Organization
ORGANIZATION ORDER	
—Usurps Responsibility And Authority Delegated To Subordinates	—Maintains Delegated Responsibility And Authority of Subordinates
—Maintains Two Separate Management Information Systems—One Informal System For Himself—Another Eyewash System To Impress His Superiors	—Maintains A Single Integrated Management System For His Organization And He Uses It
—Continuous Slippages And Overruns	—Occasional Slippages And Overruns
PERFORMANCE OF PEOPLE	
—Reduction In Sense Of Responsibility	—Willing Acceptance Of Responsibility
—Indecisive And Frustrated	—Decisive and Satisfied
PERFORMANCE OF PROJECT MANAGER	
—Indispensable	—Key People Can Carry On
—Always Too Busy In Meetings	—Never Too Busy To Meet
—Over-Cautious In Work He Doesn't Know	—Confident Of People In Work He Doesn't Know
—Over-Interested In Work He Knows	—Patient With People In Work He Knows

Figure 2.

ing. He now brings his full-line authority to bear upon his organization. Threats, measurements and reform procedures are the order of the day. People retaliate by consciously withholding information. They develop an ability to avoid responsibility and, thereby, stay out of trouble. This vicious circle goes on until the project manager is isolated in an information vacuum.

Figure 3 summarizes the impact of the leadership emphasis upon the organization.

Become a Better Project Manager.

Here are four steps to balance your skills and become a better project manager. Try them. The benefits will convince you, far beyond these words, that neglect of these skills is robbing you of success and satisfaction as a project manager.

Achieve Balanced Emphasis. This means equal emphasis on the executive, management and leadership functions and skills. There is no "cookbook" which teaches balanced emphasis. The only real test of balance is the effects of emphasis upon the organization. For this reason, continually evaluate your balance by using Figures 1, 2, and 3. More than likely, you will find your management is overemphasized at the expense of the executive and leadership function. Consciously force yourself to spend equal time on each function until it becomes persistent habitual experience. Continue to evaluate the effects of your emphasis upon the organization until confident you have achieved balance.

Set Realistic Objectives, Programs and Policies. Improve executive skills by spending more time thinking of ideas and the future. Use your ideas to control the future, not just to forecast and describe it. Think far enough into the future to take into account the delays to obtain approval and implement the decision. Prepare a statement of objectives which are projected at least five years into the future. Specify how resource requirements for objectives will be generated and allocated. Prepare a compatible statement of operating policies which will answer the important questions to be asked. Identify who in the organization structure will recommend, decide and implement actions. Establish the control system that will be used in the organization. Get together with your immediate subordinates and let them participate in setting interrelated objectives and policy. Ask them to tell you how you can help insulate them from harassment from higher authority in accomplishing their objectives. Take action to overcome this interference.

Solve Your Own Management Problems. Improve your management by solving only those problems which are referred to you by your immediate subordinates. Do not usurp delegated responsibility and authority by solving and approving their problem solving. Let them solve their own problems and expect them to make some mistakes in doing it. Insist upon a problem analysis for all exceptions. Maintain a single integrated programming-costing-budgeting-reporting system, such as PERT/Cost, throughout your organization. Be sure you use it. Take the time to teach your people how to use the management equation. Improve their management capability by using some of the newer quantitative techniques, such as cost effectiveness modeling and statistical cost estimating.

Communicate and Motivate. Improve your leadership by communicating and motivating. Improve your reading and listening skills. Pay increasing attention to improving your oral communication. Use both mass communication and man-to-man techniques. Motivate people by positive attitudes. Get them to believe that what they are doing is important. Believe your people are good and tell them they are good. Take every opportunity to commend them for any job well done.

Summary.

Student project managers from the Government and industry unconsciously neglect some of their perfected skills. In general, students neglect their innovating, anticipating, communicating and motivating skills. Management problem solving is overemphasized at the expense of executive and leadership skills.

Students correct these deficiencies by self appraisal. They become aware of their neglect in class discussions and improve by placing equal emphasis on neglected functions and skills.

You may also be unconsciously neglecting some of your skills. Self-appraisal, using Figures 1, 2, and 3, can make you aware of your neglect. You can easily improve by balancing your emphasis to be a better project manager.

IMPACT OF LEADERSHIP EMPHASIS UPON THE ORGANIZATION

POOR PROJECT MANAGER	GOOD PROJECT MANAGER
CONTRIBUTIONS FROM PEOPLE	
—Responsive Participation	—Responsible Participation
—Passive Resistance	—Active Cooperation
—Information Withheld	—Information Contributed
ORGANIZATION ORDER	
—More Procedures and Measurements	—More Policy & Encouragement
—High Price Paid for Contributions	—Low Price Paid For Contributions
PERFORMANCE OF PEOPLE	
—Uninformed, Frustrated, Defensive And Negative	—Informed, Satisfied, Cooperative And Positive
—Motives Aligned With Incentives	—Motives Aligned With Objectives
—Develops An Ability To Stay Out Of Trouble	—Willing To Accept More Responsibility
PERFORMANCE OF PROJECT MANAGER	
—Assumes People Are Unwilling	—Assumes People Misunderstand
—Blames His Subordinates	—Blames Himself
—Attempts To Demand	—Attempts to Improve
—More Authoritative	—More Communicative
—Relies More On Material Incentives	—Relies More On Moral Persuasion

Figure 3.

New Amphibious Assault Ship To Carry Helos

A new multi-purpose amphibious assault ship, designated the LHA, that will combine the use of both helicopters and landing craft in a single vessel is now being planned by the U.S. Navy.

The size and versatility of the new ship will increase the Navy's amphibious assault capability by permitting the transport of larger Marine Corps forces on a single ship.

Concept formulation and contract definition will be carried out by the Navy to obtain complete competitive design and construction proposals from industry.

Broad specifications and performance requirements will be provided to the contract bidders who will submit proposals on the complete design and characteristics of the ship. The contract will be awarded on the basis of the quality of the design, production and total life cycle costs.

A project management office, headed by Captain Frank J. Reh, USN, has been established in the Naval Ship Systems Command for the LHA project.

COIN

by

Capt. J. L. Coleman, USN

The acronym COIN has become the accepted name for an airplane designed expressly for the general field of counterinsurgency operations. The OV–10A (COIN) aircraft is being developed by the Navy as a tri-Service program to obtain a true counterinsurgency weapon system. In some circles it has been referred to as the "guerrilla warplane."

Work toward a COIN aircraft can be traced back to 1951 when a Navy design competition was held for an observation-liaison helicopter to combine the observation tasks of light airplanes with the rescue and utility tasks of helicopters.

Series of Developments.

The Navy contracted for the development of the OV–1 Grumman Mohawk in 1957 to fulfill Army and Marine Corps requirements. Financial considerations caused the Marines to abandon the OV–1, although the need for a weapon system to fill the void between the helicopter and the attack close air support bomber still existed. Later, the OV–1 was transformed into a sophisticated observation/surveillance vehicle for the Army.

In mid-1961 the Navy was asked to review the feasibility of developing an extremely small, light, simple and inexpensive airplane intended to operate in a battlefield environment at the battalion or regimental level. Called the L²VMA for Light Marine Attack, it was to be immediately available for use by the ground commander in an armed attack role as well as for observation. The L²VMA became the foundation from which the present counterinsurgency type aircraft concept emerged.

The concept of the COIN aircraft continued under study and in the fall of 1962, the Director, Defense Research and Engineering (DDR&E), added the limited transportation of personnel and cargo to the required missions. The use of this airplane, as seen by DDR&E at the time, was to replace a large inventory of obsolescent planes being used by the United States and throughout the world by the Military Assistance Program countries.

Navy Named Development Agency.

In mid-1963 military interest in the COIN concept became a reality with the Navy being assigned developmental responsibility and the establishment of a steering committee under the chairmanship of the Assistant Secretary of the Navy for Research and Development. The membership of the steering committee included the Assistant Secretaries for Research and Development of the three Services, representatives of DDR&E and the Advanced Research Project Agency (ARPA), and the Deputy Chief of Staff (Air), U. S. Marine Corps. A working level committee made up of alternates for each member provided day-to-day continuity. By virtue of the steering committee participation, the specifications developed by this group for the design competition, in effect, had tri-Service approval.

The Bureau of Naval Weapons (now Naval Air Systems Command), which was assigned development and contractual responsibility, issued preliminary specifications to industry for a LARA (Light Armed Reconnaissance Airplane) in December 1963.

Proposals were received in March 1964 from 11 firms. The Navy conducted its normal evaluation of these proposals and, after approval of the steering committee, awarded a contract to the North American Aviation Columbus, Ohio, Division to design, build and flight test seven prototype aircraft on a firm fixed price basis. The contract also contained options for the purchase of varying lots of aircraft up to a maximum of 500 on a fixed price ceiling arrangement.

Capt. Joseph L. Coleman, USN, has served as project manager for the Navy's COIN project since September 1964. Capt. Coleman is a designated Navy aviator and has a wide background of service in the Navy's air arm. He has attended the Armed Forces Staff College and the Naval War College.

Variety of Missions.

The OV–10A is designed to perform a variety of military missions, including observation and armed reconnaissance, forward air control of attack aircraft, helicopter escort, limited ground attack, target marking, gunfire spotting, liaison and utility. It could also be adapted, if desired, to perform such peacetime functions as security patrol, disaster relief, medical missions, riot control, aerial mapping and spraying.

The aircraft is to be capable of operating from rough unprepared fields, in addition to prepared airfields and aircraft carriers. Although floats are not procured for the seven prototype aircraft, amphibious float capability for operation on waterways can be provided in production aircraft.

A high degree of reliability, ruggedness, simplicity of operation and low cost was emphasized in the design of the aircraft combined with the requirements for weapons delivery, reconnaissance and light transport.

The North American concept features twin turbo-prop engines and twin booms with the horizontal tail mounted high between twin vertical tails. The fuselage is mounted under the wing and the pilot and observer are seated in tandem ahead of the propellers with virtually unobstructed visibility.

A 74-cubic-foot cargo compartment in the fuselage has a capacity for carrying either cargo or personnel. Access to the cargo bay is gained through a hinged door at the rear of the fuselage. This access permits waist-level loading of cargo or personnel. The rear seat and flight controls can be removed, thereby increasing the cargo capacity to 111 cubic feet.

The cargo compartment with the rear seat removed can accommodate

more than 3,200 pounds of cargo, five paratroopers with full equipment, six combat-equipped infantrymen, or two litter patients with a medical attendant.

The high tail assembly design provides for direct transfer of cargo from trucks which can be backed up to the loading door, and also permits paradropping of cargo or paratroopers.

External stores can be carried on five store stations. Three stations are located on the fuselage; the remaining two stations are on removable sponsons mounted on the fuselage. The sponsons also contain four fixed 7.62 mm M60 machine guns.

For a typical attack mission, the OV–10A can be armed with up to 2,400 pounds of external stores, including assorted bombs, napalm and rocket clusters, and machine guns. Two wing-tip missile stations are also provided.

Guns and armor protection provide the aircraft with its close support and helicopter-escort missions capability.

Designed to "live with the troops," the OV–10A is equipped with large tires and an extremely rugged tricycle landing gear which will enable the aircraft to operate from unimproved fields in primitive areas. The aircraft can be converted for amphibious operations by substituting twin floats, containing built-in retractable wheels, in lieu of the tricycle landing gear.

Management Plan.

On July 20, 1965, the OV–10A Weapons System Project was established as a designated project within the then Bureau of Naval Weapons with the responsibility to develop and refine the system to meet the requirements of the three Services and the Military Assistance Program.

The management of the OV–10A is accomplished through a project team assigned within the Naval Air Systems Command structure. This team is headed by the designated project manager and is staffed with deputy project managers from the Marine Corps, Army and Air Force. The project manager is assisted by assistant project managers for technical, production, support and procurement areas within the Air Systems Command. These assistant project manager members establish liaison with the parallel structure within the Air Systems Command divisions, and at parallel levels with the contractor management team. They report in the vertical structure to their division head and the project manager. Changes affecting detail specificaton or cost are processed by the team through their cognizant areas and presented to the Intra-Bureau Change Committee for approval.

The management plan for the OV–10A includes the Navy PROMPT (Program Reporting, Organization and Management Planning Technique) management tool and is used by North American Aviation as provided for in the basic contract. PROMPT provides uniform information reporting procedure and methods for systematically and periodically comparing actual performance against approved plans and schedules. The PROMPT reports are prepared in a prescribed format for insertion into a Program Profile Manual, thereby providing the current status for the project manager and contributing to the overall continuity and management of the weapon system. Once the program profile manual is established, the general policy of PROMPT is "reporting by exception."

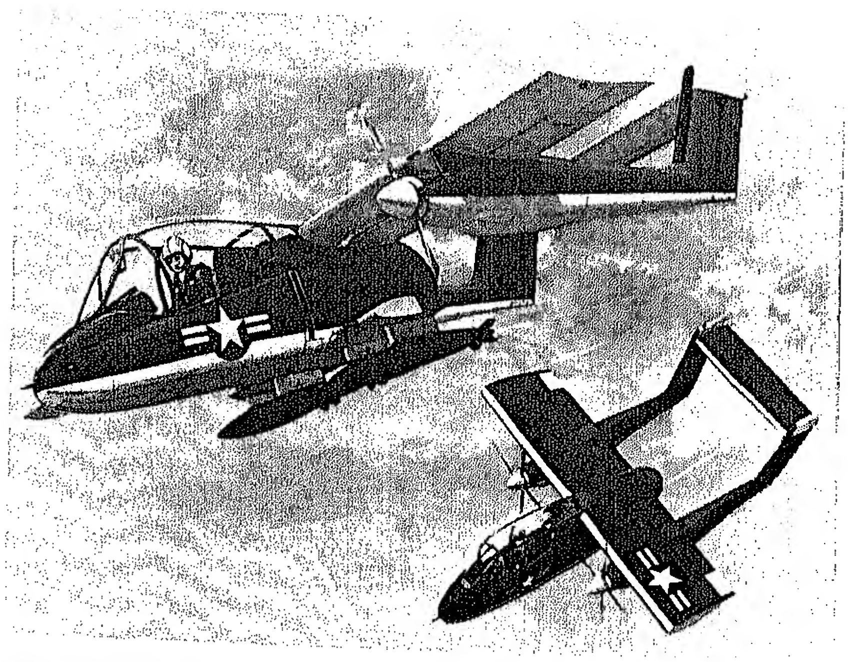
A companion system for use by all elements of the Air Systems Command is the Project Master Plan which provides the basis for the control, direction, coordination and evaluation of a project throughout all phases of a project life cycle. The program profile manual provided by the PROMPT system contributes to the make-up of the project master plan and is supplemented by the project team and other divisions of the Air Systems Command.

The principle management technique employed is Time Base Schedule consisting of milestones in all areas of accomplishment.

Present Status.

On July 7, 1965, an advanced test vehicle OV–10A aircraft was rolled out at North American Aviation's Columbus Division three months ahead of schedule. Five prototype aircraft are now flying. Three of these aircraft were used for the Navy Preliminary Evaluation completed in March 1966 by Service pilots. Upon completion of additional contractor demonstrations and development testing, a final Navy Preliminary Evaluation will be held. Subsequently, the aircraft will be subjected to trials by

(Continued on Page 17)



The multi-purpose OV–10A Aircraft (COIN) is equipped with high lift devices making it capable of operating from small unimproved fields.

DEPARTMENT OF DEFENSE

Maj. Gen. Abe J. Beck, USAF, has been assigned to duty as senior Air Force Member, Military Studies and Liaison Div., Weapon Systems Evaluation Group, Office of the Dir., Defense Research & Engineering.

Maj. Gen. Dwight O. Monteith, USAF, has been designated as Project Manager for Project Cloud Gap.

RAdm. James A. Dare, USN, has been appointed Dep. Dir. for Operations & Administration, Defense Atomic Support Agency, replacing **Brig. Gen. Kenneth F. Dawalt, USA,** who has been reassigned as Dep. Chief of Research & Development for International Programs, U.S. Army. Adm. Dare was Commander, Naval Ordnance Laboratory, White Oak, Md. before being assigned to DASA.

Brig. Gen. Thomas S. Jeffrey Jr., USAF, has been assigned as Staff Director for Aircraft, Office of Asst. Secretary of Defense (Installations & Logistics).

Paul C. Warnke, formerly a partner in the Washington law firm of Covington and Burling, has been sworn in as General Counsel for the Defense Department.

Capt. J. N. Horrocks, Jr., USN, has been assigned as Special Asst. to the Dep. Asst. Secretary of Defense (Public Affairs), replacing **Capt. Lloyd Young, USN.**

The new Dep. Dir., (Scientific), Defense Atomic Support Agency is **Dr. N. Frederick Wikner.** He succeeded **Dr. Theodore B. Taylor,** who has held the position since October 1964.

Col. Amos A. Jordan, USA, has been designated Dir., Near East, South Asia and Africa Region, Office of Asst. Secretary of Defense (International Security Affairs).

Capt. Francis B. Grubb, USN, has been appointed Comptroller and Dir. of Programs for the Military Traffic Management & Terminal Service.

Col. William D. Kyle Jr., USAF, has been reassigned as Commander, Subsistence Regional Headquarters, Chicago, Ill., Defense Supply Agency.

DEPARTMENT OF THE ARMY

Col. Eduardo M. Soler has been named Project Manager of the newly established utility tactical aircraft system at the Army Aviation Materiel Command, St. Louis, Mo.

Col. Ivey O. Drewry Jr., Project Manager for the Army's Nike-X missile defense project at Redstone Arsenal, Ala., has been promoted to the rank of brigadier general.

Kenneth M. Barnett, who had a major role in organizing the nationwide tornado forecasting service operated by the U.S. Weather Bureau, has been appointed as Dep. Dir., of the Army Electronics Command's Atmospheric Sciences Laboratory.

ABOUT PEOPLE

The new acting chief of the Small Business Office of the Army Mobility Equipment Command, St. Louis, Mo., is **Valda N. Cordell.** Mr. Cordell replaces **Ben Kaylor,** who has retired from Federal service.

Robert C. Trick, formerly with the Air Force Systems Command, has been named Value Engineering Coordinator for the Army's Strategic Communications Command in Washington, D.C.

Henry C. C. Weinkauff is retiring from his position as Chief, Planning Div., Civil Works, Office of the Army Chief of Engineers, Washington, D.C.

The following assignments have been made at the U. S. Army Laboratories, Natick, Mass.: **Col. James G. Bennett** as Chief, Airdrop Equipment Div.; and **Col. William B. Levin** as Chief, Technical Plans Office.

DEPARTMENT OF THE NAVY

VAdm. Thomas F. Connolly has been assigned as Dep. Chief of Naval Operations (Air) from duty as Commander, Naval Air Force, Pacific.

RAdm. Robert L. Townsend became Commander, Naval Air Systems Command, relieving **RAdm. Allen M. Shinn.** Adm. Shinn has been ordered to duty as Commander, Naval Air Forces, Pacific, with the rank of vice admiral.

Capt. Sam E. Edelstein Jr., has assumed duties as Dir., Naval Electronics Systems Command, Western Div., at San Francisco Bay Navy Shipyard.

Capt. Roger G. Ireland, MC, became the Dir., Aerospace Crew Equipment Laboratory, Naval Air Engineering Center, Philadelphia, Pa., Sept. 1. He succeeds **Capt. Henry G. Wagner** who has retired from the Navy.

Capt. D. R. McComish has assumed command of the Naval Supply Depot at U.S. Fleet Activities, Yokosuka, Japan. Capt. McComish relieved **Capt. E. R. Joshua Jr.,** who has been reassigned to duty with the Naval Supply System Command headquarters in Washington, D.C.

Capt. William M. Nicholson has been assigned as Dir., Deep Submergence Systems Project Office, in Washington, D.C.

Cdr. Frank W. Smith Jr., SC, is the new Officer-in-Charge of the Navy Production Equipment Control Office, Naval Air Engineering Command, Philadelphia, Pa.

DEPARTMENT OF THE AIR FORCE

Gen. James Ferguson, Commander, Air Force Systems Command, has been assigned additional duty as Dir., Manned Orbiting Laboratory (MOL) Program.

Maj. Gen. Frederic H. Miller, Commander of the Middletown Air Materiel Area, Olmsted AFB, Pa., since 1962, has retired from the Air Force after more than 30 years service. On Oct. 3, Gen. Miller began a new career with the National Aeronautics and Space Administration as Dep. Dir. of Administration and Chief of the Resources Management Office at Cape Kennedy, Fla.

Dr. Robert H. Cannon Jr., Professor of Aeronautics and Astronautics at Stanford University has been named to succeed **Dr. Robert G. Loewy** as Chief Scientist of the Air Force.

Col. Gerrit D. Fremouw has been reassigned from duty with the Strategic Air Command to Vietnam where he will serve as Chief Engineer, Base Development Div., MACV, Saigon.

New assignments in the Air Force Systems Command (AFSC) are:

Col. Ross L. Blachly, Dep. for Test Operations, Air Proving Ground Center; **Col. William G. King,** Commander, Air Force Satellite Control Facility, Space Systems Div.; **Col. Roger H. Terzian,** Dir., Research & Development Procurement, Systems Engineering Group, Research & Technology Div.; **Col. Paul H. Kenney,** Dir., AFSC Resources Planning, Hq., AFSC; **Col. James R. Pugh Jr.,** Dep. Dir. for Procurement, Aeronautical Systems Div.; **Col. Arthur D. Thomas,** Asst. Dep. for Reconnaissance, Aeronautical Systems Div.; **Col. Roy D. Ragsdale,** Dep. for Command Systems, Electronic Systems Div.; **Col. Raymond A. Gilbert,** Vice Commander, Research & Technology Div.; **Col. James H. Webb,** Dir., Gemini Support, Hq., AFSC; **Col. Robert P. Daly,** System Program Dir. of newly formed F-X Advanced Tactical Fighter System Program Office; **Col. Otis R. Hill,** Dir. of Aerospace Instrumentation, Electronic Systems Div.; **Col. Edwin V. Brown,** Vice Commander, Arnold Engineering Development Center; **Col. James O. Cobb,** Dep. for Engineering and Technology, Ballistic Systems Div.; **Col. Reynold A. Soukup,** Dep. for Technical Support, Air Proving Ground Center; and **Col. C. B. Werner,** Acting Dep. for Test and Engineering, Air Force Special Weapons Center.

New assignments in the Air Force Logistics Command are:

Col. Buddy R. Daughtrey, nominated for promotion to brigadier general, Dep. Commander, Ogden Air Materiel Area, and **Col. James T. Bull,** Dir. of Information, Ogden Air Material Area.

An Overview of Air Force Procurement

by
Lt. Col. Jacob B. Pompan, USAF

In the past several years a wide range of policies, procedures and techniques has been introduced into the Government contracting arena. Each of these innovations was designed in some respect to help achieve a better contract and to obtain a product or a service more efficiently.

Figure 1 portrays a few of these innovations.

While each of these innovations—in its own right—may well be a step forward in Government contracting, we can't make the mistake of looking at any one of them "in its own right." We must look at them in some more meaningful fashion because, if we assume that they were not developed in some random fashion, then I think it follows that there is a meaningful relationship.

In Figure 2 innovations have been placed in a more precise—a more meaningful—relationship. This article will discuss what that relationship is and how it was developed. Understanding that relationship is the first step in understanding and evaluating the changes taking place today in Defense contracting.

The purpose of this article then is to:

• Explain what the objective of the Air Force is in the Government contracting field.

• Describe how the major procurement policies support that objective.

• Describe how some of the tools or innovations, which have been designed to make these policies work, actually help achieve the objective.

I hope to show a definable connection between the Air Force procurement objective and the policies and procedures which we are faced with using each day. If we can discuss what we are putting out in the policy business in terms of the objective, then we will be a whole lot closer to the proper implementation of these policies and procedures.

One of the basic contract objectives of today's procurement effort in the contract area is achieving COST REDUCTION THROUGH THE PROFIT MOTIVE. Our cost reduction efforts with the contractor are based upon the premise that, first, the contractor is attempting to maximize his profit—both in the manner in which he manages the contracts which he has and in strengthening his position to obtain additional Government contracts. Secondly, while he is maximizing his profit, he is also decreasing the overall cost of that contract to the Government.

Now whether we achieve this objective or not in any single contract depends to a very large extent—if not totally—upon the pricing arrangement of the contract. If we have a firm fixed price (FFP) contract resulting from real price competition, the contractor has the highest cost risk and, consequently, there really should be cost reduction. If we have a sole source cost plus fixed fee (CPFF) arrangement with its minimal cost risk on the part of the contractor, the cost reduction motivation from the profit motive is likely to be weak. Between competitive FFP and CPFF, the spectrum has an infinite number of contract pricing arrangements, each of which may have a different impact on the contractor's

Lt. Col. Jacob B. Pompan, USAF, is a student at the Air War College, Maxwell AFB, Ala. Before entering AWC he was assigned in the Directorate of Procurement Policy in Headquarters, USAF and was the Air Force policy member of the Armed Services Procurement Regulation Committee.

risk and his cost reduction motivatio[n]. Therefore, it seems to follow th[at] our objective, COST REDUCTIO[N] THROUGH THE PROFIT MOTIV[E] is directly connected and, in fact, d[e]pendent upon our pricing arrang[e]ment—our pricing policy.

Now, what is this pricing policy[?] The pricing policy says simply tha[t] we should buy through price competi[tion]. The Air Force wants to awar[d] in a firm fixed price-competitive market. When we buy in that manner, the contractor has the burden of determining the most economic allocation of his resources. Of course, we also avoid the requirement for cost or pricing data, and costly administration and audit.

But uppermost in our minds as the greatest advantage of a FFP award through price competition is that we have placed upon the contractor the maximum cost risk. If there is real competition to insure that his price had to be truly competitive, we can assume that the contractor's contract cost risk really is significant and that he will strive for maximum efficiency in his operations because of that risk.

Thus far, the pricing policy is straightforward. We award on the basis of the lowest sound price—on the basis of price competition. Here the pressures and constraints of the competitive market place are being relied upon to force the price down to a reasonable figure—and force the contractor to operate efficiently.

But, as we know, a significant amount of the dollars spent by the Air Force is not spent through price competition. In FY 1965, 74.8 percent of the Air Force's total obligations were not price competitive. The inability to buy through price competition can be traced to several causes. It could be that we do not have a sufficiently well defined specification of our requirement. It could be that there are insufficient sellers to create a price-competitive market, or that time just doesn't permit competition. It is also possible that there is a follow-on procurement in which competition of any kind, much less price competition, would be unrealistic.

Now in these and similar situations where there is no price competition, how does the pricing policy operate? Here we still try to place upon the contractor the maximum degree of contract cost risk. In fact, we try to

motivate him to seek such risks. In other words, even though the contract may have been awarded on a non-price competitive basis, we still try to design the contract in such a way that the contractor will be motivated to be efficient. We want him to act as nearly as possible as he would in a price-competitive climate.

In review, we want adequate price competition to the maximum degree in our procurement because that type of procurement places the maximum cost risk on the contractor and will result in the lowest cost to the Government. However, when we cannot get price competition, we design into the contract some type of motivation which will induce the contractor to be efficient and to function as he would in a price competitive-high-risk situation.

In this non-price competitive situation we are relying upon two basic supporting policies: the profit policy and the incentive policy.

Looking first at the profit policy, we know that the Armed Services Procurement Regulation (ASPR) 3-808.1 says that we should use "profit to stimulate efficient contract performance." The policy states that low profit, the use of historical averages, and the application of a predetermined percentage are detrimental to achieving this motivation. The pricing policy, therefore, stands for the proposition that, when a contract is not awarded through price competition, the profit policy is one way to gain for the Government some of the advantages that are normally a part of the price-competitive climate. A contractor who accepts the cost risk and performs well will be rewarded with increased profit—and, if he fails to perform, his profit is reduced. Our pricing policy, our pricing arrangements, and a good number of our innovations are intimately tied into this philosophy.

It is all well and good to talk about objectives and policies, and to theorize about the economics of the model. These are the things of which speeches are made. However, it is quite another thing to provide the buyer with something concrete which can be used in the day-to-day procurement task—something which will make these policies meaningful and the objective attainable. We have this in the innovations in Figure 1.

The first step is to put these procedures—these tools—in a more understandable framework. Though we may have a whole host of tools in our kit box, they can be placed into a few logical groupings. Figure 2 portrays three rational groups. Group 1 is called an incentive group. The five innovations listed in that group are tools with which a buyer can seek to motivate a contractor to use his resources more efficiently. In one way or another, each of them—Weighted Guidelines, Incentive Contracting and Value Engineering—provides the contractor, through the incentive policy or the profit policy, and as part of the overall pricing policy, with an avenue to increase his profits while at the same time decreasing the Government's overall contract costs.

The second grouping is called the customer satisfaction group. It's relationship with the objective is perhaps less obvious than the incentive group, but it is no less important. Customer satisfaction is another way of saying

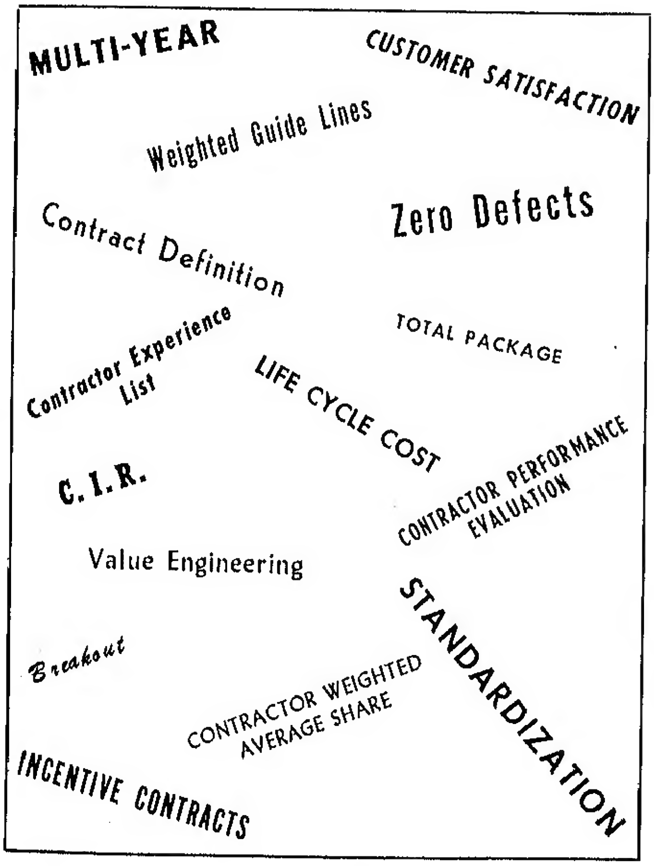


Figure 1.

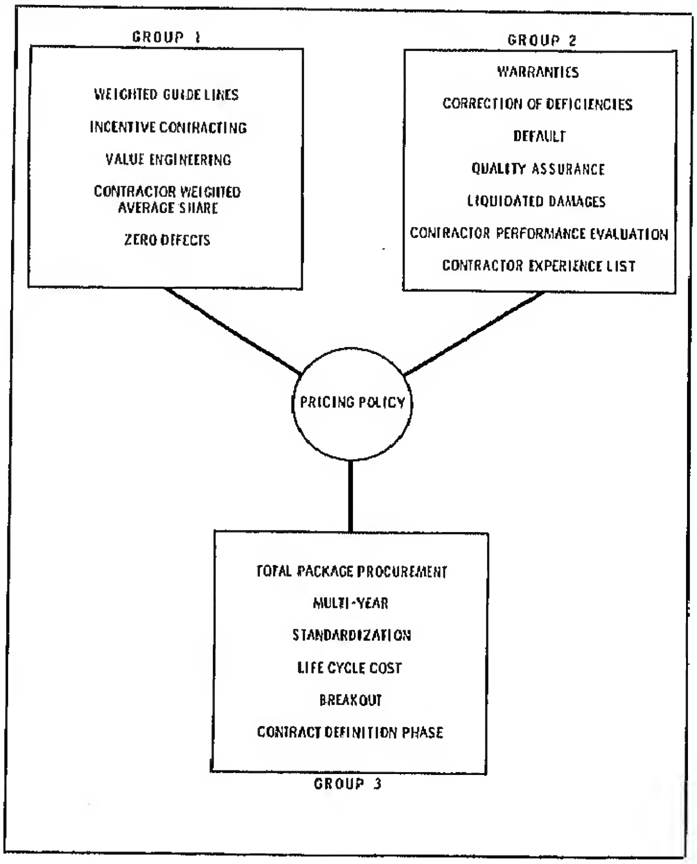


Figure 2.

that every reasonable step must be taken to insure that we ask for what we want—and get what we pay for. We are not getting what we pay for if it is delivered late or, if upon delivery, it is not reliable and does not function properly. We are not getting what we pay for or need if we must terminate for default and re-procure. The increased Air Force use of the correction of deficiencies clause and liquidated damages reflects a growing awareness of their value when used selectively. Default is an incentive—though perhaps a negative one. And the motivation of the contractor to look good in the contractor performance evaluation system and to stay far away from the Air Force and the Navy Contractor Experience Lists should be obvious.

At present there is no name for the third grouping—perhaps because it stands for a lot of different things to different people. Therefore, decide for yourself what you see in it.

However, these techniques could represent the eternal search in procurement for that fine balance between insuring the maximum possible competition and the lowest price for an item, while at the same time considering logistic support costs, and many other procurement and operational requirements. Multi-Year, Standardization, Life Cycle Cost, the Total Package Plan, Advance Procurement Planning, Breakout, and Contract Definition Phase—each is related to our objective. Some clearly are related to a greater extent than others. Each in some way motivates a contractor to reduce his costs in order to increase his profits or they give him the opportunity to increase his profits, and the reduction of costs necessarily result.

This can be made apparent by analyzing one tool from each of these groups to demonstrate that there really is a rational relationship between them and the objective of the Air Force.

We shall look first at weighted guidelines (Group 1). We are going to look at only two factors in weighted guidelines: the factor for contractor cost risk and the factor for contractor performance.

Cost risk has a profit range of from zero to seven percent depending upon three elements: type of contract, difficulty of the task, and the responsibility assumed through the type of contract. We are all aware of the extensive effort on the part of the Air Force to move away from CPFF contracting into FFP type contracts. The theory behind this effort is that, as a contractor moves towards FFP type contracting, he assumes more of the risk and, as he assumes more of the cost risk, he becomes more concerned with the expenditures of resources. He also has an opportunity for increased profits. Therefore, anything we can do to encourage him to move towards higher risk contracting—where theoretically he will be more concerned with how he spends his resources—and towards a type of contracting which will give him an opportunity to increase his profits—anything like that—is right in line with our objective of COST REDUCTION THROUGH THE PROFIT MOTIVE. If that is a reasonable conclusion, then weighted guidelines is an excellent tool to achieve that objective.

In contract cost risk the buyer, in effect, is telling the contractor that the Government will increase its negotiation profit objective under weighted guidelines if the contractor will move up the contract risk spectrum. The higher profits are worth it to us because, as he moves into higher risk contracting, the Government should achieve cost reduction due to the contractor's increased concern for how he spends his resources—or more to the point: COST REDUCTION THROUGH THE PROFIT MOTIVE.

Performance is the second factor in weighted guidelines. We know that in some contracts, such as CPFF, there is minimal cost risk to the contractor. If our theory of motivation depended solely on cost risk, we would be out of luck in a CPFF contract environment. However, motivation depends upon more than cost risk. Even in the CPFF environment, we tell the contractor that he is being watched. We are watching the way he manages his and our resources, the way he delivers, the quality of his product, and the degree to which he implements small business and labor surplus goals. We hope that this watchfulness on our part, and the contractor's knowledge that what we learn, will have a bearing upon future source selections and profit rates, will have a noticeable impact upon how the contractor operates under the present contract. We think that this factor in weighted guidelines has a very direct connection with the objective because the contractor—in theory at least—should try in any type of contract—and even in a CPFF environment—to be efficient, to allocate his resources intelligently, and to search for cost reduction. For he knows that his profits on future contracts, or even the award of those contracts, could well be in the balance.

Under Group 2 we shall discuss the correction of deficiencies clause.

How do warranties in general—and correction of deficiencies clauses in particular—relate to the Air Force objective? The Air Force has a formal correction of deficiencies policy. In its simplest form, it requires a contractor to perform precisely as he has contracted. If the product fails to perform, he must correct the deficiency. It is receiving wide application in the Air Force.

The contractor, who is faced with compliance with the correction of deficiency—or any sound warranty for that matter—and also faced with pricing constraints, has a distinct motivation which we feel is consistent with the objective. He does not want to be burdened with the costs of repair and replacement of defective material; he does not want to be pinpointed as a manufacturer of low quality material. In a price-competitive situation, he does not want to price himself out of an award by including unreasonable contingencies for this warranty. As a consequence of these considerations, we think that he will become more aware of his responsibility to provide us with precisely the product which we ordered and that he will exert more attention to the quality of his product. Finally, we feel that with these provisions the Air Force will get a better product—and this is cost reduction. When we get a product that breaks down in the field—even if it is replaced at no cost—that is not customer satisfaction. Getting paid for that breakdown is not what we are in business for. We want a product that will perform rather than just a contractor who will pay the bill for the product failure. A broader, but intelligent, use of warranties and correction of deficiencies clauses will bring home to contractors

an awareness of our interest in this performance; an awareness that his profits and the award of subsequent contracts will be affected by that performance. Hopefully, within the Air Force, it will reduce the sometimes measurable—but often immeasurable—costs that accompany materiel failure. Again: COST REDUCTION THROUGH THE PROFIT MOTIVE.

Now, let us turn to the last grouping. The innovations here are of immense importance today in procurement and the systems acquisition business. Any one of them deserves considerable space for discussion. However, the purpose of this article is only to show the tie-in to the objective. With that in mind, let's look at the latest of these: total package procurement concept. This type of procurement envisions the procurement in a single competition of the engineering development and production of a system with as much support, such as aerospace ground equipment, spares, training equipment and contractor technical support, as is practicable.

Total package seeks to avoid the dilemma caused in the past when a contractor, building only the development portion of a program, had a tendency to quote rather conservatively. He could afford to do so since the development contract amounted to a relatively small percentage of the total program. His main incentive at that juncture was to secure the contract. His overall risk was rather small, however, since his work in the development portion of the contract almost invariably established him as a sole source in the event of follow-on production. Total package procurement deals not only with the development, or the top of the iceberg as it has been called, but rather the entire program. The contractor signs a contract that includes firm prices, or a firm pricing arrangement, not only for the development but for the follow-on production right through aerospace ground equipment and support as well.

There could be many important results of this approach:

• The contractor having won, in a competitive environment, work that involves the total system will be motivated from the outset to design the product with maximum efficiency. It is unlikely that he will have many value engineering change proposals in the production portion of the contract for his financial reward in production will grow from a maximum effort during the development engineering. He will begin his value engineering at the start of development engineering.

• His cost risk is very large. He can't "buy in" with impunity, for his contract which results from competition is not merely for the development but for production as well. It is safe to say that, through this unique application of incentive contracting, the Air Force has developed a technique which magnifies not only the opportunity but earned profit on the part of the contractor, and through that opportunity, significant cost reduction.

This article attempts only to sharpen the perspective of what's happening around us in Government contracting.

Several of the techniques which buyers are faced with in everyday operations have been mentioned. However, even though only a few of them have been discussed, this relationship that I attempt to draw between the objective and the policies, and the techniques or tools, exists to some degree in every single instance—strong in some, tenuous or perhaps even disturbing in others—but, nevertheless, it is a relationship to be reckoned with.

There is one point that should be stressed. It is important to recognize a difference between the objective, the policies that support the objective, and the tools that we hope will make the policies work. The objective was set at the highest level. It is fundamental to scores of Air Force policies and actions. Changing it is extremely unlikely. The pricing policy and the supporting policies of profit and incentives are also firmly established at the highest levels within the Air Force. To some degree they are spelled out in various places in the ASPR. In some respects they merely reflect economic facts of life. They would also be difficult to tamper with.

Finally, let's look at the tools or innovations which we use to carry out the policies. These are the easiest to design and to change. Many are not yet even implemented in the ASPR. It's with these tools that the contracting officer can have the greatest influence in designing the contract. In fact he has a responsibility to evaluate these to see if they work, and recommend changes if they don't help him to implement the stated policies and achieve the objective.

In other words, don't criticize any of these innovations because you doubt the validity of the objective, or the profit or incentive policy. Rather, criticize the innovations if in your opinion they fail to help us achieve the objective.

In summary:

• There is a fundamental Air Force objective towards which all our contractual pricing efforts should be directed; that is COST REDUCTION THROUGH THE PROFIT MOTIVE.

• This objective is supported by the pricing, profit and incentive policies.

• This entire complex of the objective—the pricing policy—and the two policies of profit and incentives are, in turn, supported by a multitude of techniques. Some techniques are very valuable and firmly established in our procedures. Some are rather transitory. All impact in some way on our daily efforts to achieve the objective.

• When the contracting officer doesn't like what's going on in the Government contracting field, he has a hunting license in this area of procedures.

• We should very critically evaluate and question each innovation against the standard of what it does, or fails to do, to help us achieve our stated objective: COST REDUCTION THROUGH THE PROFIT MOTIVE.

I would like to leave you with one last word of reassurance. These large numbers of new procedures are without doubt an important part of the way we do business today. But we should all remember that they are merely a means to an end. We cannot become so enamoured with the sophisticated new techniques that we lose sight of the real reason that we resort to them, i.e., to make sure that the product or service we need comes out the end of the line at the right time, at the right place, and in a quantity and quality to satisfy our requirement. That thought is uppermost in the minds of the people that write the policies.

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Fluerics: 21. Optical Fabrication of Fluid Amplifiers and Circuits. Corning Glass Works Electronic Div., Bradford, Pa., for the Army, May 1966, 109 pp. Order No. AD-636 842. $4.

Dynamic Performance Analysis of Pure Fluid Amplifiers and Pure Fluid Computational Circuit Studies. Franklin Institute, Philadelphia, Pa., for the Army, July 1966, 106 pp. Order No. AD-634 527. $4.

A General Model for Simulating Information Storage and Retrieval Systems. HRB-Singer, Inc., State College, Pa., for the Navy, April 1966, 180 pp. Order No. AD-636 435. $5.

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Volume II, Management of Contractor Data and Reports, Authorized Data List. Air Force, 2,102 pp. Order No. PB-172 870. $19.50.

Report on the Ad Hoc Committee on Principles of Research Engineering Interaction. National Academy of Sciences, National Research Council, for the Department of Defense, July 1966, 368 pp. Order No. AD-636 529. $7.

Ignition Characteristics of Fuels and Lubricants. Bureau of Mines for the Air Force, March 1966, 88 pp. Order No. AD-632 780. $3.

Mechanism of Microbiological Contamination of Jet Fuel and Development of Techniques for Detection of Microbiological Contamination. Mel-

(Continued on Page 41)

The Specification Approach and SAIMS

by

Col. Herbert Waldman, USAF

The direction of effort to improve the performance measurement of large Defense weapon system projects and contracts was described generally in an article on the Selected Acquisitions Information and Management System (SAIMS) in the July 1966 issue of the *Defense Industry Bulletin* ("The Development of SAIMS"," p. 20). The current phase of that effort, in which the constructive collaboration of Government and industry is continuing; is the development of a DOD Schedule and Cost Planning and Control System Specification (SCPCS) for use with large negotiated contracts which are part of major high-cost and long-term programs.

We are seeking constructive comments from the industrial community to assist in developing a meaningful and workable product which may be used as a contractual requirement. In that effort the Office of the Secretary of Defense (OSD) has distributed a draft specification dated May 5, 1966, to the Council of Defense and Space Industries Association and to presidents of 60 large corporations. The development of the specification is also being coordinated with other Government agencies which share a common interest in using such techniques.

The objective of the specification approach is to outline the basic criteria that a contractor's planning and control system should meet. Among these are capabilities for providing specified kinds of data which effective planning and control systems would normally be expected to generate. Past studies conducted by DOD have consistently revealed existing deficiencies, e.g., the fact that contractor's systems for internal control were often found to be different from those used by the contractor to respond to the Government's reporting requirements.

Because DOD data requirements have often been out of phase, in both time and substance, with what was being generated in a contractor's internal management system, Defense managers have been inhibited in using contractor data in the form provided for prediction and decision making on relevant contracts and programs. Too often in the past, additional, sometimes duplicative, data requirements were generated for use in validating and adjusting originally furnished data which should have been sufficient to accomplish the intended purpose.

So long as the Government remains the contractor's cost-sharing partner, we will have an intense interest in a contractor's capability for producing results as planned and the timely delivery of specified products meeting clearly identified performance criteria. Defense interest in the management of cost in negotiated type contracts will also be stimulated by cost uncertainties which are indicated when contracts are negotiated with price ceilings as much as 30 percent over target costs.

In view of such Government interest, our current effort seeks to assure that a single internal control system will be used by our larger contractors which meets their needs as well as our own. This would eliminate the need to create separate and duplicate systems in any one plant as we have seen in the past. It has been expensive to develop many diversified systems resulting in the waste of thousands of dollars which could have been better applied to the development and production of hardware.

Col. Herbert Waldman, USAF, is Dir. for Assets Management Systems in the Office of the Asst. Secretary of Defense (Comptroller). He is a graduate of the University of Michigan and holds a master's degree in international affairs from George Washington University.

An early implementation of the DOD specification will result in better understanding of most DOD data requirements. It will greatly ease the contractors' current problems of preparing special reports which are responsive to the different criteria requested by various agencies within DOD. Implementing guidance for use by DOD components, in a form not yet determined, will also be developed with the specification approach.

The specification approach is nothing new in management. What is new is the development of a specific requirement for a contractor to:

- Plan work in significant work packages.
- Operate budget systems which are compatible with his plan.
- Accumulate, retrieve and provide current status information on a timely basis.

These points essentially promote the integration of existing data with quality improved by using some sharpened-up management tools.

There are five fundamental features in this approach:

- The contractor accommodates the requirements of the specification within his own organizational structure and determines how the items of work are related to contract objectives.
- Both the DOD procurement agency's and a contractor's schedule and cost data requirements will be derived from the same management system.
- Cost and schedule accomplishment will be identified at a level of responsibility described in terms of the contractor's management organization (work packages).
- Once DOD approves a contractor's implementation of the specification, a reduction in reporting requirements, as compared to existing practices, should occur. (The Government should utilize summary reports knowing that detailed information in a contractor's internal system will

(Continued on Page 24)

Educational Technology

by
Dr. Eugene T. Ferraro

Nearly all Defense Department activity, except actual warfare, is, for practical purposes, a form of education and training for that eventuality. Therefore, improved and superior educational processes have a significant bearing on all that we do. This is particularly true in the Air Force where we have such a high proportion of technical skill requirements as opposed to total requirements. The Air Force has been a leader in meeting this educational challenge.

What is the military—more particularly the Air Force—planning, proposing, hoping to do in the field of education?

Are we qualified to make recommendations, decisions, etc.?

Is the military viewpoint and its philosophy of educational development in the best interest of the nation's overall cultural objectives?

Recognizing that education in DOD is one of the nation's major activities, we have a responsibility to do it well, to assure that it shall not waste our resources—material and human—and that it is designed to attain our national goals — cultural and spiritual as well as military.

On June 14 and 15, after months of study planning, DOD officials presented this assessment of Defense manning to some 700 representatives of industry, education and Government. This was at a conference sponsored jointly by the National Security Industrial Association, the Defense Department, the Office of Education and the Department of Labor.

Defense spokesmen explained the massive task to be done and the programs already undertaken to improve the doing of it. They asked industry, with the help of all necessary supporting resources, to focus on this complex and difficult problem. They pointed out that, while much new technology could be made to serve approach which has served well in deriving solutions. A number of our major aerospace contractors have perfected the study and analysis techniques. Together, we have learned how to grasp the overall nature of worldwide and universe-wide problems. We have developed the "total" view which identifies and inventories all the subsystems and elements involved and finds the significant interrelationships of these parts. Finally, we have perfected a mathematical formulation technique which often allows measurement, priority establishment and some reasonable predictability.

The time has come to bring to bear the force of this analysis and solution technique to education and training. This area has earned a priority for such attention from our best analysts, economists and administrators.

The sheer magnitude of our Air Force structure requires tremendous systems study, organization planning and implementation capability. It has stimulated our concern with systems techniques and made the Air Force the nation's leading exponent; however, we realize we must go still further to retain the kind of superiority we now have.

Secretary of the Air Force Harold Brown, in response to the question, "What one thing would you like most to achieve in the next few years?" stated: "An analytical capability for the Air Force to equal its drive, excellence in management, and its great spirit. I want to help organize the talents which already exist within the Air Force to still further improve its materiel, training, and combat capability, so that it can play its part for the best interests of the United States and the Free World."

As a recent acquisition from industry with some involvement in complex tasks for the Military Services, I visualize the Air Force need for education and training as flowing first from an overall manpower analysis based on authorized force levels. Efforts are being conducted separately to improve our capabilities for this.

Second, we have a need to improve a personnel management system, under which our "inventory" of manpower resources—officers, airmen, civilians and contracted services—are surveyed continuously. This system must provide for the inflow of new personnel and the outflow of separations projected and for recognition of promotion potential and subsequent upgrading. Historical data will enable us to make quantitative estimates from which we can derive probable education and training requirements on which to plan our efforts.

Assuming we have a sound total requirements picture before us, I believe we could address ourselves to the educational and training "subsystem" and view it as a total enterprise. We would need to select three segments for a start:

- What should we be teaching;
- How should we do it?
- Are we getting results?

In more elegant terms, this would be curriculum, instructional technology and testing. This whole package would, in effect, comprise an educational technology.

We are devoting elaborate efforts to analyzing the educational and training needs of various assignments and jobs. We may be doing an excellent job; however, we may be able to get a better means of verifying the effectiveness of our programs by a

(Contnued on Page 38)

Air Force Tests Propulsive Wing V/STOL Model

The ADAM II propulsive wing, a revolutionary new aircraft with engines located inside the wings, is being evaluated by the U. S. Air Force at its Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio.

A full-span, powered model will be designed, built and tested by Ling-Temco-Vought, Inc., Dallas, Tex., under a $439,000 contract jointly funded by the Flight Dynamics Laboratory and the U. S. Army Aviation Materials Laboratory, Fort Eustis, Va.

ADAM, an acronym for Air Deflection and Modulation, features a unique integration of vertically-mounted high-bypass-ration turbofans into a propulsive wing. The thrust from the tuorbofans can be deflected downward 100 degrees for use in vertical takeoff and landing.

The powered model will have a wing span of nearly five and one-quarter feet. The model will consist of a fuselage, propulsive wing, booms and tail. Wings will house four tip turbine fans to simulate the propulsive systems.

The propulsive wing will have movable flap-ailerons, which adjust from 20 degrees up to 100 degrees down, and a tail configuration consisting of twin outboard vertical fins and outboard horizontal control surfaces.

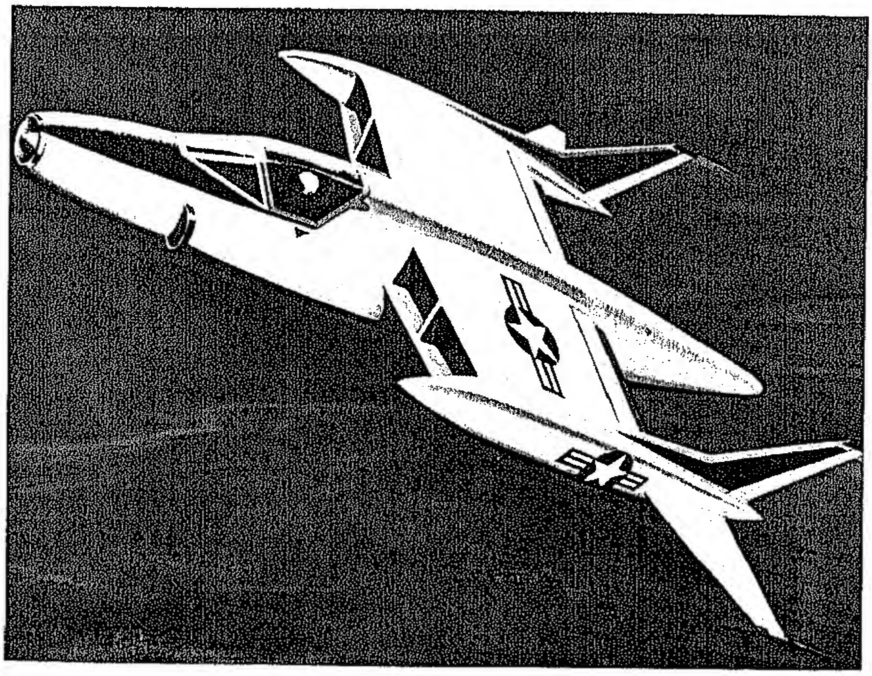
Wind tunnel tests at the National Aeronautics and Space Administration's Langley Research Center will include all flight modes. Low-speed tests in the 17-foot transition tunnel will evaluate the aircraft's vertical takeoff and landing, short takeoff and landing, and maneuvering capabilities. High-speed tests in the 16-foot tunnel will investigate effectiveness of the outboard tail, flap-ailerons and high-speed drag of the propulsive wing.

The propulsive wing design shows promise of good engine-to-airframe match in the cruise mode, a high mach number of drag divergence (which make high subsonic cruise flight possible) and relatively low downwash velocities and temperatures for vertical takeoff and landing.

Possible uses of the ADAM concept would be for an aircraft with a high subsonic strike-reconnaissance capability operating from widely dispersed landing sites, and vertical takeoff and landing transport aircraft.

The contract is the first undertaken by the Flight Dynamics Laboratory in its investigation of vertical-short-field takeoff and landing (V/STOL) aerodynamics. To expand its research capabilities in this area, the laboratory has established a V/STOL Aerodynamics Group in the Flight Mechanics Division.

Work on the 15-month contract on the ADAM II propulsive wing will be completed in May 1967.



ADAM II. An artist's concept shows a fighter aircraft which incorporates engines within the wing. With a 100-degree downward deflection of the aircraft's thrust, the fighter can operate from short landing fields in forward combat areas.

NORAD To Award Contracts on Command and Control Platform

The North American Air Defense Command has announced that contracts totaling more than $4 million will be awarded to develop a new air defense airborne command and control platform.

Since last summer, major aircraft companies have been doing feasibility studies for an airborne warning and control system (AWACS) for the Air Force. Boeing and Douglas Aircraft have been picked to conduct further studies aimed at completion of concept formulation in about a year.

It is expected negotiations will result in an award of contracts of $2,100,000 each to these companies.

Upon determination that an appropriate radar design is available, one of the contractors will be selected to develop prototype systems.

AWACS is envisioned as an automated airborne command and control system for world-wide use with air defense and tactical forces. It would use a high-performance, subsonic aircraft carrying radar, communications and data-processing equipment.

According to air defense experts, the system would make it impossible for enemy bombers to fly over, under, or around the radar surveillance network.

COIN

(Continued from Page 8)

the Navy Board of Inspection and Survey and an All-Service Evaluation Group.

Present Marine Corps requirements are for 100 OV–10A's which will be used for both visual and photographic reconnaissance, for escorting helicopters, for limited close air support, and for light cargo and personnel transport. In short, the OV–10A (COIN) is expected to be a versatile vehicle for the Marine Corps in the sort of environment which it now faces in Southeast Asia.

The Air Force has a current requirement for 157 OV–10A aircraft for use primarily in the forward air controller role.

The Army is closely monitoring the COIN development primarily for a vehicle to be used for electronic surveillance operations. More sophisticated electronic equipment would be required for this mission.

Military Assistance Program use of the COIN would need only a small amount of unsophisticated equipment. Firm commitments for this use are expected in the future.

CALENDAR OF EVENTS

Oct. 25-26: Ninth Navy/Industry Conference on Material Reliability, Washington, D.C.

Oct. 27-28: Tulsa Chamber of Commerce Air Festival, Riverside Airport, Tulsa, Okla.

Oct. 31-Nov. 2: Defense Supply Assn. National Convention, Benjamin Franklin Hotel, Philadelphia, Pa.

Nov. 2: Industrial Management Society Meeting, Chicago, Ill.

Nov. 2-4: Northeast Electronic Research & Engineering Meeting, Boston, Mass.

Nov. 2-4: Air Force/National Security Industrial Assn. Meeting, Patrick AFB, Fla.

Nov. 8-10: Joint Computer Conference, San Francisco, Calif.

Nov. 9: National Security Industrial Assn. Meeting, Naval Ordnance Laboratory, Corona, Calif.

Nov. 14-16: American Petroleum Institute Meeting, New York City, N.Y.

Nov. 15-17: Ships Control Systems Symposium, Annapolis, Md.

Nov. 17: Industrial Procurement Conference, Louisville, Ky.

Nov. 29-Dec. 2: American Institute of Aeronautics and Astronautics Annual Meeting and Technical Display, Boston, Mass.

Nov. 29-Dec. 1: American Society for Metals Meeting, Detroit, Mich.

Nov. 30-Dec. 2: Wire and Cable Symposium, Atlantic City, N.J.

Dec. 7: Pearl Harbor Day, Nationwide.

Dec. 4-8: American Institute of Chemical Engineers Meeting, Detroit, Mich.

Dec. 5-8: Chemical Specialities Mfg Assn. Meeting, Hollywood, Fla.

Dec. 16: Wright Memorial Dinner Aero Club of Washington, D.C.

Dec. 26-31: American Assn. for Advancement of Science Meeting, Washington, D.C.

Dec. 27-28: Industrial Relations Research Assn. Meeting, Chicago, Ill.

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Increased Tactical Aircraft Production Announced

Secretary of Defense made the following statement on Sept. 22, 1966, concerning increased production of tactical aircraft for FY 1968:

"You will recall that when I announced a cutback of approximately one billion dollars in the planned expenditures for air munitions production last July 11, I also announced that we were examining into production schedules for ground munitions, aircraft, helicopters and other large cost items.

"We have now completed a review of the tactical aircraft situation. In the case of air munitions, we found it prudent to decrease production rates while building to an air ordnance inventory of more than 500,000 tons within a year. Now we find it prudent to act to increase the production of tactical aircraft for FY 1968 by approximately 280 planes. The cost of the additional aircraft will amount to approximately $700 million.

"As you know, the FY 1967 defense budget was based upon the assumption that combat operations in Southeast Asia would continue to June 30, 1967. I told Congress repeatedly that if the conflict were to continue beyond that date we would have to adjust certain programs accordingly.

"Because of the long lead times involved in aircraft production, I have come to the conclusion that it is wise now to place on order aircraft that may be required to support operations beyond June 30, 1967.

"Our review was based on many factors, including projections on numbers and types of sorties and predicted loss rates. It takes into account all experience to date. Tactical aircraft production schedules for FY's 1966, 1967 and 1968 have been developed to insure that new deliveries of aircraft will exceed potential losses."

Project AIMS

Identification—Friend or Foe (IFF)

by
R. G. Stiles

With the advent of radar in the late thirties, it became necessary to identify in some way the friendly aircraft and other vehicles detected by these radars. This identification was required to prevent destruction by friendly anti-aircraft batteries, etc., and had to be accomplished by some sort of cooperative device in the aircraft or other vehicle itself. These devices were then, and still are, triggered by signals from the ship, aircraft, or ground installation requiring identification. The last 10 years have seen an increasing demand for better and more accurate identification equipment for aircraft and, in some instances, surface craft. The aircraft requirement applies not only to military vehicles, but also to aircraft in a civilian environment. To this end, improvements have been developed for the existing Mark X (SIF) series of IFF beacon equipments.

In 1961 the President directed that the Federal Aviation Agency (FAA) establish project BEACON for the express purpose of conducting "an engineering review of all aviation facilities and related research and development." This review was to result in a practical long-range plan to ensure efficient, safe and positive control of all aircraft within the United States.

Basically, the AIMS program is a DOD-directed project involving the Navy, Marine Corps, Air Force, Army and FAA. The Services require equipment in all categories of the program, while the FAA is involved in the air traffic control only.

This article will be devoted to the air traffic control portions of the program. In order to provide as near a common system as possible among the agencies involved, the AIMS program was established by DOD with the Air Force as the executive agent. The System Program Office (SPO) was established at Wright-Patterson AFB, Ohio, under the Aeronautical Systems Division (ASD). The program director has his headquarters there and coordinates and directs all aspects of the development and procurement of equipment. The Navy AIMS project was established by Chief of Naval Material charter in February 1965, although Navy AIMS responsibility in the program dated back to September 1963, when the DOD AIMS project was chartered. During this interval, the project/program managers in the IFF field in the Bureau of Naval Weapons and the Bureau of Ships were responsible for the coordination of the program among the Services and in conjunction with the several interested Bureau of Naval Weapons offices for the coherence of the program in the Navy itself.

In order to meet the requirements of the National Standard for Common System Component Characteristics for the IFF Mark X (SIF)/Air Traffic Control Radar Beacon Systems, much of the existing beacon equipment must be scrapped and new units provided. The new equipment involves the following major changes to the basic Mark X (SIF) System:

- The first feature will permit individual identification of aircraft, thus improving the air traffic control capabilities. This improvement also will lend itself to automatic control facilities.

R. G. Stiles, Dep. Project Manager, Navy AIMS Project Office, has been working as a civilian employee with the Navy Department since 1950. He was one of the original staff of the AIMS Project Office when it was established in 1965.

- The next added feature will be altitude reporting aiding the air traffic control functions and reducing the amount of traffic on the voice communications networks. The altitude reporting requirement necessitates changes to the airborne transponder, allowing it to reply to a new interrogation mode, and provide for the transmission of data encoded from altitude information. This means also that aircraft altimeter systems must be updated to meet the maximum error requirements of $\pm$ 250 feet established as the system goal and also to provide data fed to the transponder transmitter. To accomplish this, the altitude sensors must be either redesigned or relocated in the aircraft and a pick-off devised to encode altitude information to feed to the transponder.
- When airborne transponders are triggered by energy radiated in the side lobe pattern of the interrogator antenna, replies of a spurious nature are generated. These lead to errors in azimuth determination and also tend to produce noisome clutter on the display scope. To eliminate this problem side lobe suppression techniques must be applied to the circuitry, both in the transponder and in the interrogator.
- More clutter is added to the displays by non-synchronous replies, i.e., replies by a transponder to interrogations from other interrogators. These produce what is known as "fruit." To eliminate this situation, defruiting techniques must be developed to discriminate against replies to interrogators other than the one of immediate interest.
- In order to provide an improved IFF system, it will be necessary to increase the duty cycle of the interrogator transmitter and incorporate state of-the-art advances in the control circuitry for the transmitter. This necessitates some re-engineering effort which can be accomplished on a production contract.
- The final change necessary to the system will be to frequency stabilize the interrogator transmitter to tolerances specified by the national standard and not required in the earlier equipment.

In addition to the implementation of the specific capabilities noted above, the AIMS program is also responsible for the standardization of essential system characteristics among the Services. This permits meeting

overall operational requirements on land, on the sea and in the air with a minimum of differences in equipment among all users.

The preceding paragraphs have presented the impact of the new system on the old and have shown the way the Services will handle the new operational equipment. Let us now turn to the system itself and determine how it works.

The scope of this project is such that large quantities of equipment in all categories will be procured. In general, contracts will be awarded on a competitive basis from approved AIMS specifications.

The AIMS system consists of interrogators—asking a coded question; transponders—replying to the coded question; computers—decoding both questions and responses; servoed altimeters—providing altitude information; and altitude encoder sets—providing coding information to the transponder for transmission to requesting interrogator.

As shown in Figure 1, the interrogators are included in all AIMS-equipped ground and surface sites and in some airborne vehicles. The interrogator is generally associated with, or slaved to, a primary radar and derives target azimuth and range information from this source. The transponders are utilized in aircraft to provide identity and altitude information, but can also play a useful role in identification of friendly surface craft and ground sites.

When the Navy AIMS project was chartered by the Chief of Naval Material, the project manager, Captain Norman D. Champlin, was assigned responsibility for the Navy portion of the AIMS program. Tasks involved include research, development, test and evaluation, acquisition and support of the AIMS systems, subsystems and equipment used by the Navy or by the other Services when assigned to the Navy for procurement by the Air Force SPO at Wright-Patterson AFB.

The project manager is also assigned responsibility for control of funds and budgeting. Systems engineering and system integration in the Navy area are his responsibility in accordance with such directives as may be handed down by the Air Force project director and also by the Chief of Naval Material.

The management of this project demonstrates the ability of the three Services to come up with and administer a common program. The efforts are reflected in reduced development and procurement costs and in the use of equipment common to all types of DOD activity. It has shown what progress can be made by the Services in conjunction with a civilian agency since the FAA is directly involved.

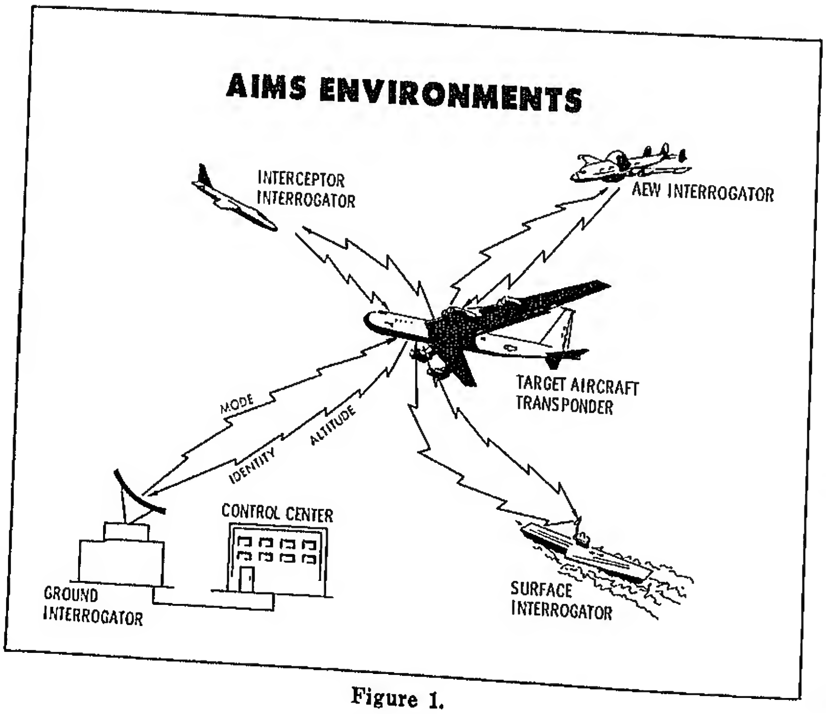

Figure 1.

Metalworking Technology To Be Subject of USAF Symposium at Las Vegas

A Metalworking Technology Symposium—the first in a series commemorating the golden anniversary of the Air Force Materials Laboratory, Wright-Patterson AFB, Ohio—will be held Jan. 10-13 in Las Vegas, Nev.

The purpose of the symposium is to review progress in Air Force-sponsored metallurgical processing programs and to forecast manufacturing methods requirements in this area for Air Force sponsorship in the next five years. The symposium, sponsored by the laboratory's Metallurgical Processing Branch, Manufacturing Technology Division, will feature technical sessions on forging, rolling, casting, extruding and drawing, powder metallurgy, composite materials, and specialized metalworking processes and equipment.

Technical papers representing significant technology developed under Air Force contract will be presented by project engineers from the Metallurgical Processing Branch and its contractors.

Approximately 500 representatives of Government, industry and universities are expected to attend. The meeting is open to Government contractors, Government personnel, and producers and users closely related to the production of aircraft and aerospace systems.

For further information contact the Metalworking Technology Symposium Department, Air Force Materials Laboratory, P. O. Box 7, Dayton, Ohio 45401.

MBT–70 Project Test Organization Established

The American test organization which will evaluate the joint United States-Federal Republic of Germany Main Battle Tank for the 1970's has been established.

The test program will be directed from the U. S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md., by Colonel Jack P. Libby, heading the new Systems Test Manager's Office, MBT–70.

A two-man international Program Management Board will consist of Major General W. G. Dolvin, representing U. S. interests, and Colonel Dr.-Ing. Helmut Schoenefeld, the German member.

U. S. prototypes will be routed to installations and activities of the Test and Evaluation Command in the continental United States and Alaska for engineering and service tests. German models will be tested concurrently at European proving grounds of the German army located at Trier, Munster-Lager and Meppen.

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DECEMBER 1966

SPEAKERS CALENDAR

DEPARTMENT OF DEFENSE

Mr. B. B. Lynn, Dep. Dir., Defense Contract Audit Agency, at the National Assn. of Accountants Meeting, Chicago, Ill., Nov. 14; at the Electronic Industries Assn. (Government Procurement Relations Dept.) Meeting, Colorado Springs, Colo., Nov. 17; at the New York State Society of Certified Public Accountants Meeting, New York City, N.Y., Nov. 30.

Lt. Gen. H. C. Donnelly, USAF, Dir., Defense Atomic Support Agency, at World Affairs Council Meeting, Pittsburgh, Pa., Nov. 17.

Maj Gen. J. B. Bestic, USAF, Dep. Dir. for National Military Command System Technical Support, Defense Communications Agency, at Information System Science and Technology Congress, L. G. Hanscom Field, Mass., Nov. 23.

DEPARTMENT OF THE ARMY

Mr. William P. Durkee, Dir., Office of Civil Defense, at U.S. Civil Defense Council Conference, Louisville, Ky., Oct. 24-28.

Lt. Gen. William F. Cassidy, Chief of Engineers, at Ports of Philadelphia Day Luncheon, Philadelphia, Pa., Oct. 28.

DEPARTMENT OF THE NAVY

RAdm. Pierre Charbonnet, Commandant, Eight Naval District, at Navy Day Dinner, New Iberia, La., Oct. 25.

Hon. Paul H. Nitze, Secretary of the Navy, at Navy League Dinner, New York City, Oct. 26; at Navy Day Celebration, Charleston, S.C., Oct. 27.

RAdm. J. McNair Taylor, Commandant, 12th Naval District, at Navy Day Lunch, Portland, Ore., Oct. 26.

Hon. Robert H. B. Baldwin Under Secretary of the Navy, at Navy Day Luncheon, New Orleans, La.; at Navy Day Dinner, Naval Air Station, Pensacola, Fla., Oct. 27.

Hon. Robert A. Frosch, Asst. Secretary of the Navy (Research & Development), at Industrial Conference, Washington, D.C., Oct. 27.

Adm. Thomas H. Moorer, Commander-in-Chief, Atlantic Fleet, at Navy Day Luncheon, Philadelphia, Pa., Oct. 27; at Navy League, Fort Lauderdale, Fla., Oct. 29.

RAdm. Henry L. Miller, Chief of Information, at Navy Day Celebration, Baton Rouge, La., Oct. 27; at Marine Underwriters Meeting, New York City, Nov. 17; at Navy League, San Antonio, Tex., Nov. 23; at Pearl Harbor Day Observance, Philadelphia, Pa., Dec. 7.

RAdm. D. F. Smith, Commander Naval Air Test Center, at Navy Day Lunch, Jacksonville, Fla., Oct. 27.

RAdm. J. W. Williams, Dep., Commander, Submarine Force, Atlantic Fleet, at Navy Day Dinner, Evanston, Ill., Oct. 27.

RAdm. E. J. Fahey, Commander, Naval Ship Systems Command, at Navy Day Luncheon, Cleveland, Ohio, Oct. 27.

RAdm. Noel A. M. Gayler, Asst. Chief of Naval Operations (Development), at Navy Day Dinner, Bremerton, Wash., Oct. 29.

RAdm. Harold G. Bowen Jr., Dep. Chief of Naval Operations (Development), at Ship Control Systems Symposium, Annapolis, Md., Nov. 15.

RAdm. R. Whitaker, Commanding Officer, Military Sea Transportation Service, at Navy League, Newark, N.J., Dec. 1.

DEPARTMENT OF THE AIR FORCE

Brig. Gen. E. L. Ramme, Dir., Supply and Services, Office of Dep. Chief of Staff (Systems and Logistics), at Defense Supply Agency Convention, Philadelphia, Pa., Nov. 1.

Hon. Robert H. Charles, Asst. Secretary of the Air Force (Installations and Logistics), at Chamber of Commerce, Granite City, Ill., Nov. 3.

Brig. Gen. E. B. Giller, Dir., Science and Technology, Office of Dep. Chief of Staff (Research & Development), at Society of Aerospace Materiels and Processing Engineers Meeting, San Diego, Calif., Nov. 10.

Lt. Gen. W. Austin Davis, Vice Commander, Air Force Systems Command, at Third Annual S. D. Heron Award Dinner, Wright-Patterson AFB, Ohio, Nov. 22.

Brig. Gen. J. S. Bleymaier, Commander, Air Force Western Test Range, at American Institute of Aeronautics and Astronautics Meeting, Boston, Mass., Nov. 29—Dec. 1.

AF Shifts TF–39 Engine Management

A shift in responsibilities for management of the TF-39 aircraft engine and an initial assignment for its maintenance and overhaul have been announced by the Air Force Logistics Command.

San Antonio Air Materiel Area, Kelly AFB, Tex., will assume the responsibilities of item manager and specialized repair activity for the TF-39, which will power the C-5A heavy logistics aircraft.

Oklahoma City Air Materiel Area, Tinker AFB, Okla., had previously been designated item manager.

Maneuvering Unit Under Development

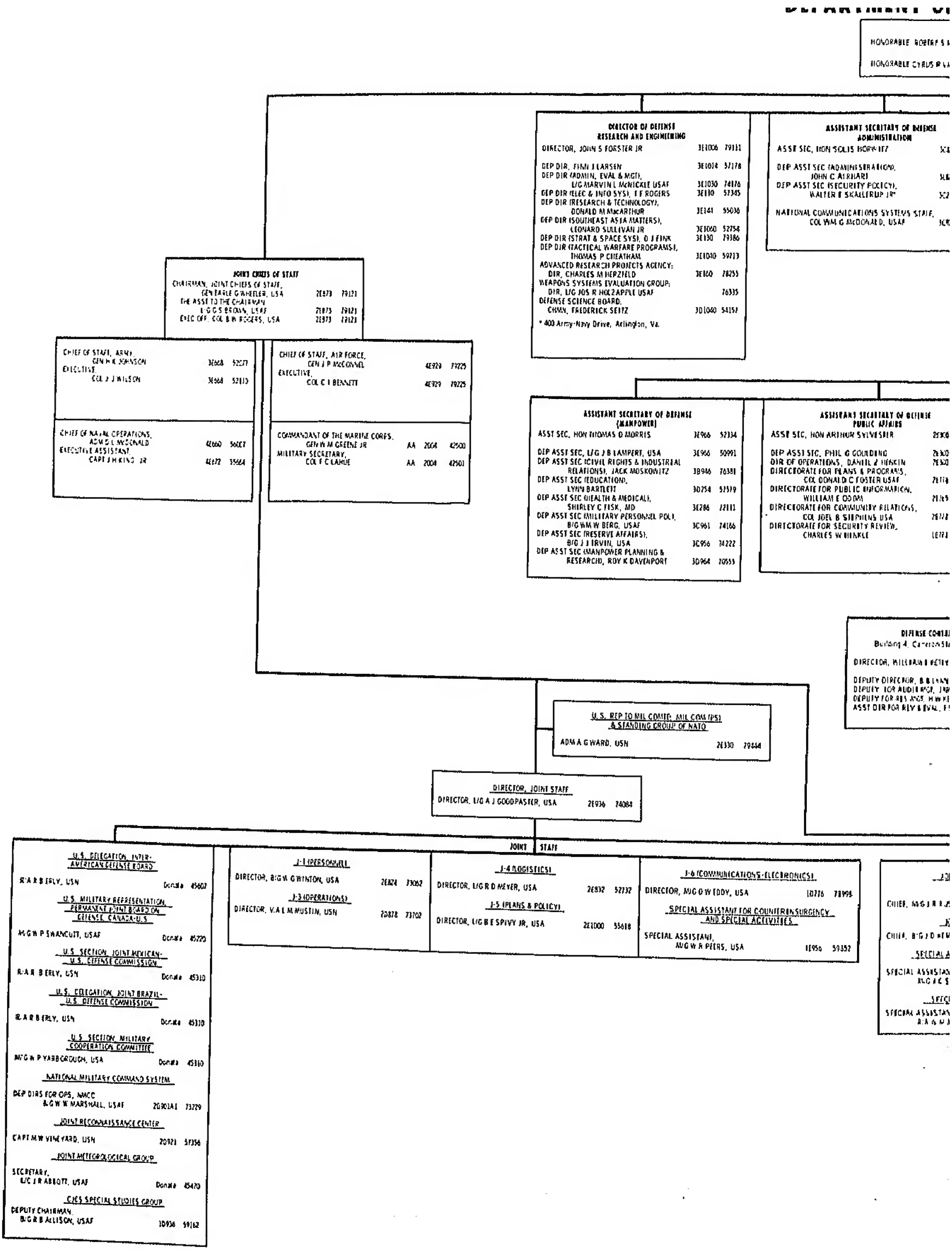
Development of a Dual-purpose Maneuvering Unit (DMU) that can be worn by a space pilot or be operated by remote radio and television signals is now under way at the Air Force Systems Command's Research and Technology Division.

A one-year study contract to establish mission requirements for the DMU during the 1968-1972 time period, prepare a design, and build a full-scale lightweight mockup has been awarded to Bell Aerospace Corp.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July 1965–June 1966	July 1964–June 1965
Procurement from All Firms	$34,877,967	$26,112,838
Procurement from Small Business Firms	7,611,496	5,304,803
Percent Small Business	21.8	20.3



October 1966

SE --- DIRECTORY*

F DEFENSE 3E880 55261
3E921 56352

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4A155 88373
4A350 88308
4A815 88351

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CDR, NAVELECSYSCOM, R/A JOSEPH E RICE MN 3006 61229
CDR, NAVSHIPSYSCOM, R/A EDWARD J FAHY MN 3046 62058
CDR, NAVORDSYSCOM, R/A ARTHUR R GRALLA Mun B 3032 63033
CDR, NAVSUPSYSCOM, R/A H J GOLDBERG MN 0026 63412
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DCS/P&R L/G ROBERT J FRIEDMAN 4E1006 55226
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SURGEON GEN, L/G RICHARD BOHANNON T-8 2718 69515
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ND CONTROL S GROUP 1D823 76406
S AGENCY 1D956 57769
STRATEGIC MOBILITY 2E844 50953
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CHIEF OF STAFF, M/G W T SMITH, USAF 4225 43157

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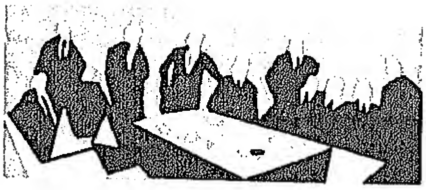
DIRECTOR, L/G J F CARROLL, USAF 3E258 57353
EXEC, COL H O CREWS, USAF 3E258 78844

AUG 15, 1966



MEETINGS AND SYMPOSIA

OCTOBER

Colloquium on the Photographic Interaction Between Radiation and Matter, Oct. 26-27, at Washington, D.C. Co-sponsors: Air Force Office of Scientific Research and the Society of Photographic Scientists and Engineers. Contact: Dr. Amos G. Horney (SRC), Air Force Office of Scientific Research, Washington, D.C. 20333. (Area Code 202) OXford 6-8705.

NOVEMBER

25th Anniversary Symposium on Personnel Research and System Advancement, Nov. 1-3, at San Antonio, Tex. Sponsors: Personnel Research Laboratory and Southwest Research Institute. Contact: Jack Harman, Southwest Research Institute, San Antonio, Tex. (Area Code 512) OV 4-2000.

Ship Control System Symposia, Nov. 15-17, at Annapolis, Md. Sponsor: U.S. Navy Marine Engineering Laboratory. Contact: Walter J. Blumberg, Steering Committee Chairman, USN Marine Engineering Laboratory, Annapolis, Md. (Area Code 301) 268-7711, ext. 8670.

Fifth Annual Symposium on Physics of Failure in Electronics, Nov. 16-18, at Columbus, Ohio. Co-Sponsors: Battelle Memorial Institute and the Rome Air Development Center. Contact: Joseph Schramp (EMERP), Rome Air Development Center, Griffiss, AFB, N.Y. 13442.

Third Annual Failure Analysis Seminar, Nov. 17-18, at the NASA Manned Spacecraft Center, Houston, Tex. Co-sponsors: Texas Chapter of the American Society for Metals and NASA Manned Space Center. Contact: Dr. David E. Hartman, Houston Research Institute, Inc., 6001 Gulf Freeway, Houston, Tex. 77023. (Area Code 713) 928-5001.

Third Congress on Information Systems Science and Technology, Nov. 21-22, at Buck Hill Falls, Pa. Co-Sponsors: Electronic Systems Div., (AFSC), and Mitre Corp. Contact: Col. C. A. Laustrup (ESRC), Project Officer, Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. 01731. (Area Code 617) 271-4527.

Symposium on the Structure of Surfaces, date undetermined, at Durham, N.C. Sponsor: Army Research Office-Durham. Contact: Dr. H. M. Davis, Dir., Metallurgy and Ceramics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N.C. 27706. (Area Code 919), 286-2285, ext. 31.

DECEMBER

15th Annual Wire & Cable Symposium, Dec. 7-9, at Atlantic City, N.J. Sponsor: Army Electronics Command. Contact: Milton Tenzer, Electronic Parts and Materials Div., Electronics Components Laboratory, Army Electronics Command, Fort Monmouth, N.J. 07703. (Area Code 201) 535-1834.

Fourth Symposium on Unconventional Inertial Sensors, Dec. 6-7, at the Department of State Auditorium, Washington, D.C. Sponsors: Naval Air Systems/Ordnance Systems Commands; Research & Technology Div., (AFSC), and the Institute of Navigation. Contact: Capt. Ross E. Freeman, USN (Ret.), Executive Dir., Institute of Navigation, Suite 912, 711 14th St., N.W., Washington, D.C. 20005. (Area Code 202) 783-3296.

American Ordnance Assn. Symposium on the Fabrication and Utilization of Lightweight Armor, (Classified), Dec. 13-14, at the Army Tank-Automotive Center, Warren Mich. Sponsor: American Ordnance Assn. Contact: Director for Advisory Service, American Ordnance Assn., Transportation Building, Washington, D.C. 20006.

First Nuclear Criticality Safety National Topical Meeting, Dec. 13-15, at Las Vegas, Nev. Sponsors: American Nuclear Society and organizations and contractors of the Atomic Energy Commission, NASA and the Air Force. Contact: A. J. Smith, Nuclear Reactor Safety Group (WLAS-1), Air Force Weapons Laboratory, Kirtland AFB, N.M. 87117.

SAIMS

(*Continued from Page 15*)

indicate what and where the problems are.)

- The contractor will plan his cost and schedule accomplishment upwards within his own organization, i.e., beginning at the level of first line supervision.

The acceptance of this approach will foster an environment in which Government and industry can better resolve the issue of the management interface where major Defense programs of critical consequence are concerned. The essential nature of relationships and responsibilities in these matters has yet to be resolved. What is basic in deciding on an acceptable arrangement is that there be good visibility and clear communication in those programs in which contract completion is a matter of vital concern.

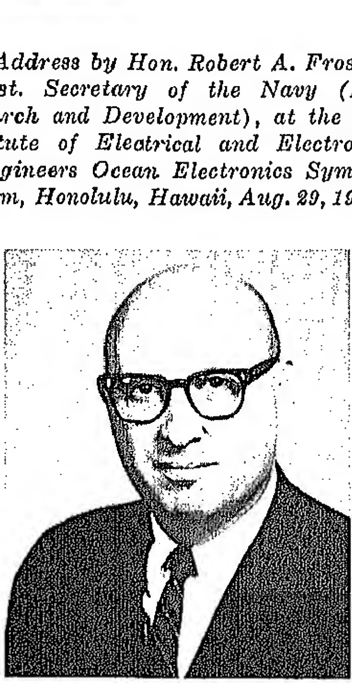
The visibility promoted through the specification approach will be provided under the following conditions:

- No major changes should be required to the contractor's existing work authorization, budgeting and accounting systems.
- Common terms and report formats will be employed to maximize understanding.
- Problem areas can be identified in detail by element of cost and organizational responsibility.
- A contractor may change and improve the details of his internal control system so long as he continues to meet the basic criteria.
- Flexibility in accounting for contingencies will communicate better information for management.
- The accomplishment of technical (product) performance goals can be related to the information framework for recording cost and schedule accomplishment.

While current development of the standard DOD specification is being carried on within OSD, a separate effort in the same direction is being implemented by the Air Force Systems Command (AFSC) procurement activities. The OSD effort is currently undergoing industry coordination and will undoubtedly supersede any individual Service planning and control system specifications or procedures after the coordination process is completed. In view of some evidence of confusion about the source of documents which have been developed in this subject area, draft or discussion materials circulated during the development process should be examined to distinguish the DOD draft version of the specification from that originated within the Air Force by AFSC.

FROM THE SPEAKERS ROSTRUM

Address by Hon. Robert A. Frosch, Asst. Secretary of the Navy (Research and Development), at the Institute of Electrical and Electronic Engineers Ocean Electronics Symposium, Honolulu, Hawaii, Aug. 29, 1966.



Hon. Robert A. Frosch

National Oceanographic Program

* * * *

It is customary in discussing oceanography to point out, first, its vital importance to our national defense, a fact which certainly cannot be exaggerated and, second, to catalog the fabulous wealth that lies in the sea—wealth in the form of minerals and chemicals that will soon be in short supply on land and wealth in the form of food and fresh water for an already protein-starved and water-starved world.

Because these facts are known to most of you here, I will not elaborate on them.

Instead I would like to take a few minutes to invite your attention to very recent developments which will have a profound and almost immediate effect on the whole field of oceanography, both military and non-military.

The first is the Marine Resources and Engineering Development Act of 1966 which President Johnson signed into law on the 17th of June.

We are fortunate in having in the Congress at this point in our history a number of perceptive congressmen who have taken the time to make a thorough study of oceanography and its importance to the national welfare. This law is the result of careful consideration and intelligent compromise on the part of these gentlemen.

Though the dollar expenditures will probably not be the same, this law will escalate the national oceanographic program to the same level of public interest and awareness as accrued to the space program from the National Space Act of 1958.

Oceanography is defined in many ways depending upon the individual discussing the subject. The law has adopted the board view, prevalent in Congress and in industry, that oceanography connotes far more than scientific study. In this law the term, marine science, is applied to oceanographic and scientific endeavors and discipline as well as engineering and technology in and with relation to the marine environment (marine environment including the oceans and the Great Lakes as well as their boundries).

The law sets up a National Council on Marine Resource and Engineering Development to be headed by the Vice President of the United States and made up of cabinet members and agency heads with a major statutory interest in the field. I was privileged to attend the first meeting of this national council less than two weeks ago.

It is certainly obvious to all of us who attended this first meeting that the Vice President has had a long standing personal interest in oceanography, and intends to devote whatever personal time is needed to carry out this aspect of his duties. I can assure you that this administration is taking the challenge of ocean exploration most seriously. Although the life this national council is limited to period of about 22 months, it has statutory set of purposes "to develo encourage, and maintain a coordinate comprehensive, and long range n tional program in marine sciences f the benefit of mankind." It is t policy of this administration to u the council as a policy-making body expand scientific understanding of t oceans, to accelerate the developme of marine resources, and to establi an engineering capability to reali the full potential of the oceans in co tributing to our national security a well being.

The act requires the council to p pare an annual report on the Nation Oceanographic Program for the Pre ident to transmit to the Congress. T report will describe Federal mul agency programs, evaluate these a tivities, and will set forth reco mended funding for all participati agencies during the succeeding fisc year.

This council's other responsibiliti are:

- To advise and assist the Preside in an annual review of Federal p grams, surveys of such activities a steps to coordinate the activities all agencies.
- To develop long range poli studies of the potential benefits of t oceans to the U. S. economy, securi health and welfare, including a stu explicitly aimed at international leg problems.
- To evaluate and interpret t study report to be developed by t citizens' commission before it is tra mitted to the President.
- To coordinate a program of inte national cooperation in work pursua to marine science activities.

Dr. Ed Wenk was appointed by t President as the new executive sec tary to the council and was sworn by the Vice President at the fi national council meeting. He will the Vice President's right hand m for matters under the jurisdiction the national council. Dr. Wenk w

formerly Chief of Congress' Science Policy Research Staff and the Legislative Reference Service of the Library of Congress, and before that Executive Secretary of the Federal Council for Science and Technology. He has made major personal contributions to the design and engineering of deep submersibles.

The law further empowers the President to appoint a commission on marine sciences, engineering and resources to be composed of 15 members from industry, universities and maraine laboratories as well as the Federal and state governments. This citizens' commission is given up to 18 months to study and to recommend to the President of the United States and Congress an overall plan for present and future needs. The President expects to announce appointments to this commission within the next few weeks.

As chairman of the Interagency Committee on Oceanography, I have been directed by Dr. Horning, the President's Science Advisor and Chairman of the Federal Council for Science and Technology, to cooperate in every manner with the national council.

In summary, we now have a national policy council on oceanography at the very highest level in Government chaired by the Vice President of the United States. Under the umbrella of this council, the Interagency Committee on Oceanography (ICO) will discharge its responsibilities and the staff of the ICO will completely support the work of the council. We hope that arrangements can be made so that the council can call on the citizens' commission or its individual members and staff, as a group of experts in and out of Government, to act as advisers to this national council. Thus we will have everyone in the Federal Government engaged in oceanography pulling together under the policy direction of the Vice President to come up with recommendations to the President of the United States to carry out the statutory set of purposes under this new act.

Now, I don't want to second-guess the findings of a commission that is yet to be appointed and a policy council that has just met for the first time, but I do think that a long shadow has been cast toward the future by the report of the Panel on Oceanography of the President's Science Advisory Committee (PSAC).

The report is entitled "Effective Use of the Sea" and is available from the Superintendent of Documents at the Government Printing Office for 60 cents. You couldn't make a better investment—perhaps most of you have already made your investment. You don't have to agree with everything in it (and, parenthetically, I have found no one who does) to realize that it is a significant report, which is going to affect the shape of things to come in oceanography.

The PSAC report defines oceanography as all "activities within the ocean that have significant scientific or technological content." This definition is in keeping with the broad popular meaning given to oceanography over the past few years.

The title, "Effective Use of the Sea," comes from the recommendation that the national objective of our ocean program should be "effective use of the sea by man for all purposes currently considered for the terrestial environment."

An attempt to answer the question, "What is the proper role of the Federal Government in oceanography?" is indicated by their statement that "division of effort among Government, industry, and universities appropriate to land-based activities is advisable for the oceans and that the Federal Government should not preempt these activities to the extent it has, for example, in space."

Assigning highest priority to those efforts in oceanography that deal with national security, the report discusses the increasing need for the Navy to be prepared to defend the developing interest in all depths of the ocean, and to provide for the continuing projection of U. S. power on and under the oceans in an era of increasing sophistication in the use of the seas. This leads the report to recommend expansion of Navy capabilities which will permit operation anywhere within the oceans at any time. As you know, the Navy has under way a Deep Submergence Systems Project including Man-in-the-Sea. This report further asserts that this effort as presently constituted is insufficient if the Navy is to meet its goals in a reasonable time period.

The report recommends assignment of Federal program responsibilities for Man-in-the-Sea and undersea technology to the Navy. Thoughts and plans are relatively inexpensive. To put them into effect costs money. As the result of a study which proposed a plan for the Navy's future role in undersea technology, the Navy has included a new line item in the FY 1968 budget request, entitled "Deep Ocean Technology."

I fully support the Chief of Naval Operations in his statement before the Navy League that the Navy will require improved capabilities in its undersea strategic forces, anti-submarine warfare forces, as well as the ability to perform undersea search and recovery operations. Improvement of the Navy's capabilities in these areas depends largely on our national ability to discover and exploit new knowledge in ocean science and our success in developing new and relevant ocean technology.

We have seen a new horizon emerging, centering on our capability to engineer the oceans. We now face problems attendant upon our ability to explore the oceans, to exploit the oceans, and to occupy portions of the oceans' bottom.

I join the Secretary of the Navy, who for years has been convinced that the general area of ocean exploration and exploitation offers a challenge just as great as that posed by the current exploration of outer space, and that it will ultimately require a national effort on a comparable scale.

Our oceanographic programs are dramatic. They have captured the imagination of the public, foreign and domestic. To say the least, they are interesting, to you and to all engineers and scientists.

I urge you to keep informed on these programs and national developments in oceanography and to prepare to work with us on the important and fascinating problems in this exciting field. It should be clear that while the Navy will lead in ocean technology, it will really be a national effort, a corporate endeavor: science, industry, and the Navy.

In summary, the PSAC oceanography report recommends that the nation's oceanographic activities be supported by the Navy "in discharging its mission of national security through its laboratories and industry and through the Office of Naval Research support of civilian institutions,

as well as by its supporting role in the development of undersea technology and provision of national test facilities."

In the civilian sector the report deals at length with the role of oceanography in facilitating the underwater recovery of oil and minerals, in providing fish protein and technology for a protein-starved world and with many other subjects such as water pollution, conversion of salt water to fresh, the role of the oceans in world weather.

The specific recommendations assigned the highest priority in the civilian sector to its development of food resources and the development of the capability for environmental prediction. The development of coastal regions for recreation and commerce were assigned a very high priority and the development of a modern hydrographic survey technology was assigned a high priority.

The establishment of marine study centers; marine wilderness preserves; deep sea and tropical laboratories and facilities for specialized marine studies; and a national center for collection, maintenance and distribution of living marine organisms are recommended in the report.

Since oceanography has progressed rapidly and many clearly identifiable problems exist, the report recommends a shift away from broad ocean surveys to solutions of specific problems. The need for oceanographers to evolve some fairly elaborate measuring arrays, with limited regions heavily instrumented, led to the recommendation for a step-by-step buoy program.

In discussing oceanographic research the report recommends that oceanographic research ships be separately funded as a block, and be grouped generally into regional fleets of reasonable size.

The major organizational recommendation would combine the Environmental Sciences Services Administration, Geological Survey, Bureau of Commercial Fisheries, and oceanographic activities of the Coast Guard and the Bureau of Mines in a single agency. This new agency would support the national effort by management of environment and ocean resources and providing description and prediction services through a balanced program of direct participation and support of industry and universities.

At the request of the President, each Federal agency is considering the recommendations contained in "Effective Use of the Sea." The ICO is now in the process of examining the implications of these recommendations and the Vice President regards the analysis of the PSAC report as one of his council's priority assignments, and expects to utilize the next council meeting for this purpose. In his charge to the Vice President, the President requested the National Marine Council to carefully study the many recommendations of the report and to consider these proposals in developing suggestions for the President for 1968.

At this time I can speak only for the Navy. Budgets permitting, the Navy intends to follow its recommendations. In the field of oceanography we feel an obligation to the entire nation. Almost every bit of oceanographic information gathered is not only of use to the Navy, but also to others in the oceanographic community. For instance, the work we do on sonar can be used to develop methods for studying the migratory habits of fish.

It is obvious that while pursuing military objectives, the Navy has an obligation to the national interest in ocean technology. We would like to see Navy dollars do double duty in supporting the civilian sector. In addition, the Navy accepts the responsibility for helping to develop the national undersea technology needed for effective use of the sea in the military, economic, social and political sense. This, again, must be a corporate venture: a science-industry-Navy team.

To be certain that the Navy's portion of the National Oceanographic Program budget is carefully and wisely invested, the Secretary of the Navy and the Chief of Naval Operations have completed taking another long, hard look at the entire Navy oceanographic program. They have thought in terms of a more centralized authority to give even a better focus to the entire Navy program in oceanography and related efforts.

The Secretary of the Navy, the Honorable Paul Nitze, has taken an action that will not only strengthen the Navy's oceanographic program but increase the Navy's ability to cooperate with all other agencies involved in our national oceanographic effort.

Effective immediately, the Secretary has established a new office of the Oceanographer of the Navy and invested it with the necessary expanded authority to provide centralized direction of all the Navy's oceanographic activities.

The new office will be headed by Rear Admiral O. D. Waters, Jr., who has been serving in the more limited position previously designated as Oceanographer of the Navy and also as Commander of the U. S. Naval Oceanographic Office.

Since the Secretary's instruction is not long and since it is written in the plain English for which he is noted, I will quote it to you in its entirety:

"This instruction defines the Naval Oceanographic Program, establishes an Office of the Oceanographer of the Navy, and prescribes the mission of the Oceanographer of the Navy.

"The Naval Oceanographic Program encompasses that body of science, technology, engineering, operations, and the personnel and facilities associated with each, which is essential primarily to explore and to lay the basis for exploration of the ocean and its boundaries for Naval applications to enhance security and support other national objectives.

"The mission of the Oceanographer of the Navy is to act as the Naval Oceanographic Program Director for the Chief of Naval Operations, under the policy direction of the Secretary of the Navy, through the Assistant Secretary of the Navy (Research and Development), and to exercise centralized authority, direction and control, including control of resources, in order to insure an integrated and effective Naval Oceanographic Program.

"In carrying out his assigned responsibilities, the Oceanographer of the Navy is authorized to issue directives, management plans, requirements, tasks, instructions, and to allocate resources for the Secretary of the Navy and the Chief of Naval Operations.

"The Chief of Naval Research is assigned additional responsibility as Assistant Oceanographer of the Navy for Ocean Science.

"The Chief of Naval Material, with approval of the CNO, has assigned the Deputy Chief of Naval Material (Development) additional responsibility as Assistant Oceanographer of the Navy for Ocean Engineering and Development.

"With the approval of the CNO, the Oceanographer of the Navy will designate an Assistant Oceanographer of the Navy for Oceanographic Operations. Pending this designation, the relationships of the Oceanographer of the Navy and the U. S. Naval Oceanographic Office remain as at present.

"The Oceanographer of the Navy shall budget, justify, and administer all funds allocated to the Naval Oceanographic Program as required for implementation of the program, shall insure that adequate funds are budgeted by activities of the Navy Department for support of the program; and shall develop and maintain a comprehensive budget documented for presentation to higher executive authorities and Congressional Committees.

"All national facilities, centers, and missions of the National Oceanographic Program assigned to the Department of the Navy will be managed and administered by the Oceanographer of the Navy.

"The Office of the Oceanographer of the Navy is hereby established directly under the Chief of Naval Operations.

"The Oceanographer of the Navy, under the Chief of Naval Operations, shall command the Office of the Oceanographer of the Navy.

"The Chief of Naval Operations shall issue the necessary directives to implement the provisions of this Instruction."

That is the end of the Secretary's instruction. Its unequivocal language leaves no doubt that the Navy views its work in oceanography as a major portion of its effort to maintain the defense of the nation at sea, and that it is organizing its resources to make a major contribution to the national effort; a team effort among the academic community, industry, state and Federal agencies sharing the responsibility to work together under the leadership of the President and Vice President of the United States.

Address by Lt. Gen. H. C. Donnelly, USAF, Dir., Defense Atomic Support Agency, at Rotary Club Meeting, Albuquerque, N. M., Sept. 29, 1966.

Lt. Gen. H. C. Donnelly, USAF

The Frontier of Technology

The character of technological progress is CHANGE. In fact, the one thing that is constant in life today is CHANGE. We have seen many changes in our lifetime, but these are only a prelude to what the future holds. The changes to come could be the most significant ever faced in the history of man. I hope that we can be farsighted enough to take the right kind of action as these changes occur.

Farsightedness today is a very desirable characteristic; and speaking of farsightedness reminds me of the little girl whose father took her to the zoo to see all the wild animals. On viewing the lion pacing back and forth in his cage, the little girl looked troubled, and her dad asked her what was the matter. "Daddy," she replied, "If that lion gets out of his cage and eats you up, what bus do I take home?" That's being farsighted!

There are many categories of change about which we have to be farsighted. The population explosion, the role of computers, and a host of other matters warrant our attention; but since I'm in the nuclear business, I'm going to talk mainly about the changes that have and will come to us through nuclear technology.

My association with nuclear technology has been fixed primarily in the weapons area. The potential of nuclear energy, however, by no means begins nor ends with defense. The frontier that opened up with the discovery of fission is as broad and full as our scientific curiosity wills it. But nuclear weapons have captured the lion's share of the headlines.

For example, the atmospheric tests of nuclear weapons by France and Red China renewed world-wide concern about radioactive fall-out. But this new concern has been considerably less than was felt in the past, because now we understand more about radiation. We know that mankind has lived with radiation from things in nature ever since we first appeared on this earth. And we know that this natural background radiation is many times greater than the amount to which present fallout may expose us. Without implying that radioactive fallout is not a hazard, we can think of it as less harmful than the polluted air around the world's industrial cities. More than a thousand deaths resulting from smog were recorded in 1909 in Glasgow, Scotland. In 1948, twenty people died from the contaminated air of Donora, Pa. In December 1952, four thousand deaths in London were attributed to smog. Fallout from nuclear explosions has yet to compile such a record.

Strangely enough, the chances are pretty good that nuclear energy will help us reduce air pollution substantially within this century. For other reasons, primarily economic, this help already has begun in places such as Pittsburgh and Chicago where commercial nuclear power plants are in operation. Such plants need no combustion air and emit no toxic gases. They do not contribute to air pollution. With each substitution of a nuclear plant for one that operates on fossil fuels, a reduction in air pollution results.

Because large scale nuclear power production is beginning to offer a distinct economic advantage, it's probable that large areas of the United States one day soon will use electricity generated by nuclear power plants. Some of the contamination of our air from coal and oil burning generator plants thus will be eliminated. This also would be true of nuclear power applications in manufacturing plants.

Air pollution also may be reduced even more in the future by the use of electric-drive automobiles. The bat-

teries would be charged at service stations that pump volts instead of gallons. The tiger in the tank will become a sort of electric eel! The primary source of energy for these service stations again would be a nuclear power plant. It's conceivable that the same large nuclear power plants on our technological frontier will do more than light and heat our homes and service facilities, run our industry and power our automobiles. These same plants could also operate desalting plants located near the oceans and help to supply us with fresh water. In fact plants of this kind are now under construction in California. Just imagine what a large supply of relatively inexpensive fresh water would mean to the Southeast and Far West. The Southwest has a special interest in this stretch of the nuclear frontier.

This rich land of America that we know today could not have been developed if human muscle and animal strength had been our only sources of energy. The industrial revolution which made our good life possible depended primarily on coal, gas and oil—the fossil fuels. In the United States today we have six percent of the world's population, but we use about 35 percent of the world's energy output. Our reserves of fossil fuels are large. But we are forced to see that they are limited when we recognize that world energy demands increase annually at a rate of about three and one-half percent. We are expanding our nuclear frontier simply because we must.

There is another reason why we will be compelled to push forward into the nuclear future. Through our use of fossil fuels, we are adding some six billion tons of carbon dioxide to our atmosphere each year. Aside from being a health hazard, this pollution has given rise to the prediction that a climatic change could result within the next few decades, a warming up of the atmosphere that could melt the polar ice sufficiently to flood our costal areas beneath a rising ocean.

I've confined my remarks so far to our nuclear potential in the areas of light and heat and mechanical power. And I've done no more than scratched the surface of possible applications. I haven't tried to cover everything because I don't want to keep you here all afternoon. I want to have time in my crystal-balling to touch on some of the benefits to be found in other areas of nuclear technology. The first of these is related to our nuclear weapons effects research in the Defense Atomic Support Agency.

As you know, we conduct nuclear tests underground. This, of course, is part of our defense mission and one of the requirements of our Safeguards Program under the Limited Test Ban Treaty. In the future, however, underground nuclear explosions may be an aid in the mining industry or in creating large underground reservoirs for gas, oil, or water. One project of particular interest to New Mexico is the "Gasbuggy" test proposed by the Atomic Energy Commission (AEC), the Bureau of Mines and the El Paso Natural Gas Company. The San Juan Basin, covering the northwest corner of this state and spilling over into Arizona and Colorado, has been recommended as the site of a nuclear fracturing experiment to increase production from a natural gas field. Fracturing refers to cracking the formation rock to induce greater production. If the process proves commercially feasible, it might be employed to advantage in the other Rocky Mountain natural gas fields.

A similar project to study the use of nuclear explosions to increase oil productivity from shale is under way.

Nuclear explosives are expected to play an important part in the construction of a new Panama Canal. And they also may be used to carve out passes through our mountains for highways and railroads of the future. Needless to say, the ships that pass through the canal and the trains that use such mountain passes will operate on electricity produced by nuclear energy.

In addition to the things we'll be able to do with nuclear explosives, our technological frontier will provide us with a variety of new and improved products made possible through radioisotopes and nuclear radiation. Many of them will be made of essentially new substances polymerized by radiation. Already new plastics and plastic-wood combinations are being made with equipment that uses the radioisotope to change the molecular structure of materials. Similarly, isotopes are being used to preserve food for longer periods than refrigeration allows. It's safe to predict that some of our food in the future will come from crops improved through treatment with radioisotopes.

The Army, the AEC and the Bureau of Commercial Fisheries of the Department of the Interior joined forces to build the Marine Products Development Irradiator at Gloucester, Mass., one of our major fishing ports. Fish, as you know, are among our most perishable foodstuffs. Experiments at the Gloucester facility have shown that preservation of this important protein source is lengthened considerably by irradiation. Since taste and nutritional value are not affected, this program shows promise for ultimate commercialization.

In similar irradiation experiments with fruit, the shelf-life of bananas, for example, has been extended two weeks by treatment with radioisotopes.

Radioisotopes have already gained a firm place in medicine. In the future, our hospitals will commonly use them for diagnosis and treatment of many illnesses. We have long been accustomed to X-rays, a form of radiation used in medical diagnosis for years before we came up with our first atomic bomb. I doubt if anyone here today has not been subjected to dental or chest X-ray examinations. Radioisotopes will be useful in examining body conditions that might be overlooked in X-rays.

Isotopes are used extensively today in biological research, helping to reveal new knowledge of the body and life processes. In some future instances, radiation or the laser beam will be used in place of conventional surgery. The laser beam is now being used in some eye operations. Radiation surely will be used to sterilize the instruments now used in surgical operations.

Serious thought is already being given to the development of an artificial heart powered by a radioisotope, Plutonium 238—the same isotope used as a compact source of electricity in some of our space experiments. The first space orbiting of such a nuclear battery took place on June 29, 1961. Now, more than five years later, it still is powering equipment that sends signals back to earth. Based on this performance record, it's conceivable that not only a heart might be powered in such a way but also that our astronauts might one day deliver such a power source to the moon, leaving it there to power radio transmission

equipment for a year or more after the astronauts have returned to earth.

The space uses of isotopes and nuclear power are many. As Dr. Glenn Seaborg, Chairman of the AEC, observed, "The family of the future will watch live telecasts, direct to their homes, of events happening anywhere on the globe—telecasts made possible by orbiting synchronous satellites powered by nuclear energy. And perhaps on one of these television programs they will follow a manned mission to a distant planet—a trip made possible through the use of nuclear rockets and auxiliary nuclear power."

Perhaps it is this ability of nuclear energy to extend the human senses that is the most important part of the technological frontier. We now are able to see into ourselves and to observe the microcosmic world inside matter. We are able to photograph cosmic events that happened billions of light years ago. Our sense of hearing, too, has been enormously extended by technology. Our radar systems can scan the skies and the seas, permitting pilots to fly their planes through darkness and submarines to avoid underwater mountains. Giant ears now can pick up the sounds of distant worlds within the universe and listen for patterns which might indicate the existence of intelligent life other than our own here on earth. We now can even hear the voices of fish in the deep water where light doesn't penetrate.

With radar helping us to find our way beneath the oceans, we can use nuclear power to explore the depths and even to pump up the vast resources of the ocean floor for use by man. Isotope-powered beacons and buoys and navigational satellites will help us find our way on the ocean surface. It's not inconceivable that nuclear energy will make it possible for man to live beneath the seas if he so chooses.

I mention this possibility of life underwater in thinking primarily of people who will work there mining and farming the ocean floor. But I mentioned the population explosion earlier and I'm reminded that there are roughly three and one-half billion human beings in the world today. It's taken us a million years to reach that population figure. But with an increasing birth rate and a declining rate of death, the world population in the next 30 to 40 years could be about six or seven billion. One day, elbow room on this earth will be at a premium.

We will need more land on which to live and more land on which to raise food. We will have to increase the arable land of this world and make it more productive. We will be forced to build cities in regions where few people would care to live now—on mountaintops and deserts and, perhaps, under the seas. Such cities might have to be lighted, heated and air-conditioned almost continuously.

At first glance, this would seem to be a situation to be "viewed with alarm." Modern technology, however, has given us the means to cope with the needs of the situation I described.

A mountaintop where people live comfortably exists now in Wyoming where the Air Force uses a nuclear power plant to heat, light and operate its Sundance radar site. A similar nuclear facility, operated by the Navy, makes it possible for men to live year round in the frigid temperatures of McMurdo Station, Antarctica. The Army operated its Camp Century on the Greenland icecap for several years with nuclear power. These military stations, established more or less on an experimental basis, have demonstrated that the fuel supply problems associated with human existence in hostile environments can be overcome with nuclear power.

The nuclear fuel core for an Army power plant in Alaska normally is flown to its destination in a standard cargo plane. Weighing roughly 900 pounds, it sustains operation of the plant, producing electricity and space heating, for more than a year. A diesel oil plant of comparable size, operating over the same length of time, would require a continuous fuel supply, some 90,000 barrels of oil weighing in excess of 26 million pounds and requiring 750 tank truckloads to get it to its destination.

The nuclear frontier, like the frontiers that faced the American pioneers, has its challenges. It also has its hazards. But beyond these, which after all give zest to the adventure, the frontier holds a technological promise that surpasses anything in the history of mankind so far.

The great westward migration of the 1800's also had its dangers. Defenses were the bowie knife and the flintlock rifle, puny defenses compared to our modern nuclear deterrent. But the westward movement of the 1800's and our present-day venturing on the technological frontier share a common characteristics, the curiosity of a vigorous and valiant human breed.

Then there's the story of the man who risked his life to climb a rugged mountain. When asked why he wanted to climb that mountain and risk his life, the man replied, "Because it's there."

This probably is the most important reason why we will move on into the frontier of technology—because it's there.

DOD Aims To Reduce Top Secret Inventories

A proposed change calling for the establishment of an annual Top Secret inventory and the elimination by destruction of Top Secret documents will be incorporated into a forthcoming revision of DOD Directive 5200.1, "Safeguarding Official Information in the Interests of the Defense of the United States."

The change will also include provisions for an annual review of Top Secret record documents to reduce the inventory through downgrading, declassification and transfer; and the clarification of document accountability procedures.

Control of SYNCOM Earth Satellite Goes to STRATCOM

All ground-based link terminals in the SYNCOM satellite program have been turned over to the Army's Strategic Communications Command (STRATCOM) for operational control.

The five-station network consists of five transportable satellite communications terminals, around the world. The Navy operates two seaboard terminals.

Until now, the Army's Satellite Communications Agency controlled the SYNCOM ground environment, with personnel provided by STRATCOM.

STRATCOM, headed by Major General R. J. Meyer, manages the Army's global long-haul communications and extends into more than 30 countries. Its Pacific subcommand will coordinate all SYNCOM matters with the Defence Communications Agency.

Department of Defense
Prime Contract Awards by State
TABLE 1. NET VALUE OF MILITARY PROCUREMENT ACTIONS[a]

Fiscal Years 1965 and 1966

(Amounts in Thousands)

State	Fiscal Year				Current Quarter			
	July 1964—June 1965		July 1965—June 1966		April—June 1965		April—June 1966	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
TOTAL U. S.[b]	$26,631,132		$35,713,061		$8,864,768		$12,645,511	
NOT DISTRIBUTED BY STATE[c]	3,363,052		3,999,758		1,102,783		1,327,918	
STATE TOTALS[d]	23,268,080	100.0%	31,713,303	100.0%	7,761,985	100.0%	11,317,593	100.0%
Alabama	165,176	0.7	281,549	0.9	46,431	0.6	96,187	0.9
Alaska	74,175	0.3	71,666	0.2	19,205	0.2	22,370	0.2
Arizona	176,857	0.8	248,228	0.8	69,952	0.9	75,511	0.7
Arkansas	39,284	0.2	95,701	0.3	9,990	0.1	27,562	0.2
California	5,153,639	22.1	5,813,078	18.3	1,550,286	20.0	1,843,560	16.3
Colorado	249,151	1.1	255,893	0.8	65,717	0.8	98,742	0.9
Connecticut	1,180,111	5.1	2,051,560	6.5	384,377	5.0	705,802	6.2
Delaware	38,239	0.2	37,445	0.1	12,578	0.2	6,153	0.1
District of Columbia	247,576	1.0	328,111	1.0	81,658	1.1	52,727	0.5
Florida	633,332	2.7	766,955	2.4	103,363	1.3	163,588	1.4
Georgia	662,417	2.8	799,362	2.5	169,718	2.2	400,478	3.5
Hawaii	72,213	0.3	64,170	0.2	22,164	0.3	23,311	0.2
Idaho	11,724	0.1	20,004	*	4,271	0.1	6,729	0.1
Illinois	421,899	1.8	919,779	2.9	178,892	2.3	427,797	3.8
Indiana	604,925	2.6	1,068,259	3.4	309,462	4.0	391,799	3.5
Iowa	133,951	0.6	247,619	0.8	49,385	0.6	98,199	0.9
Kansas	229,051	1.0	312,629	1.0	33,076	0.4	91,735	0.8
Kentucky	42,749	0.2	70,057	0.2	11,600	0.1	23,726	0.2
Louisiana	255,834	1.1	302,906	1.0	22,565	0.3	57,945	0.5
Maine	68,771	0.3	51,340	0.2	8,030	0.1	24,520	0.2
Maryland	584,383	2.5	842,527	2.7	211,462	2.7	283,354	2.5
Massachusetts	1,178,729	5.1	1,335,952	4.2	397,383	5.1	464,335	4.1
Michigan	532,897	2.3	918,426	2.9	196,153	2.5	395,362	3.5
Minnesota	259,500	1.1	497,994	1.6	109,587	1.4	164,322	1.5
Mississippi	152,188	0.7	162,305	0.5	66,518	0.9	76,699	0.7
Missouri	1,060,781	4.6	1,112,665	3.5	630,264	8.1	419,092	3.7
Montana	69,375	0.3	13,779	*	7,725	0.1	2,160	*
Nebraska	42,708	0.2	80,478	0.3	9,856	0.1	36,288	0.3
Nevada	19,142	0.1	32,028	0.1	5,792	0.1	4,502	*
New Hampshrie	52,400	0.2	109,591	0.3	13,797	0.2	48,578	0.4
New Jersey	820,309	3.5	1,090,122	3.4	266,778	3.4	403,390	3.6
New Mexico	84,137	0.4	86,230	0.3	30,665	0.4	25,104	0.2
New York	2,229,478	9.6	2,819,153	8.9	1,002,666	12.9	1,110,498	9.8
North Carolina	288,408	1.2	449,331	1.4	63,353	0.8	150,244	1.3
North Dakota	48,997	0.2	88,113	0.3	10,160	0.1	19,396	0.2
Ohio	863,118	3.7	1,588,955	5.0	340,285	4.4	579,630	5.1
Oklahoma	119,803	0.5	158,492	0.5	20,083	0.3	36,248	0.3
Oregon	39,624	0.2	89,983	0.3	14,531	0.2	29,200	0.3
Pennsylvania	988,811	4.2	1,665,087	5.3	326,475	4.2	749,988	6.6
Rhode Island	86,323	0.4	131,722	0.4	17,895	0.2	66,656	0.6
South Carolina	81,580	0.4	176,424	0.6	17,272	0.2	70,516	0.6
South Dakota	21,062	0.1	23,315	0.1	3,695	0.1	4,562	*
Tennessee	197,283	0.8	502,168	1.6	35,239	0.5	184,523	1.6
Texas	1,446,769	6.2	2,291,454	7.2	315,624	4.1	771,032	6.8
Utah	191,173	0.8	169,681	0.5	45,733	0.6	40,095	0.4
Vermont	32,202	0.1	81,066	0.3	14,056	0.2	39,568	0.3
Virginia	469,097	2.0	425,487	1.3	172,434	2.2	170,298	1.5
Washington	545,607	2.3	444,368	1.4	139,036	1.8	97,778	0.9
West Virginia	90,312	0.4	149,300	0.5	62,996	0.8	61,628	0.5
Wisconsin	203,003	0.9	364,684	1.1	60,215	0.8	181,921	1.6
Wyoming	7,867	*	11,112	*	1,037	*	2,190	*

For Footnotes, see page 35.

* Less than 0.05%.

TABLE 2. NET VALUE OF MILITARY PROCUREMENT ACTIONS BY DEPARTMENT[a]

July 1965—June 1966

(Amounts in Thousands)

State	Total Percent	Total Percent	Army[e]	Navy	Air Force	Defense Supply Agency
TOTAL U. S.[b]	$35,713,061		$10,324,723	$9,710,832	$10,355,777	$5,321,729
NOT DISTRIBUTED BY STATE[c]	3,999,758		962,943	1,013,120	1,165,161	858,534
STATE TOTALS[d]	31,713,303	100.0%	9,361,780	8,697,712	9,190,616	4,463,195
Alabama	281,549	0.9	99,331	16,407	53,093	111,718
Alaska	71,666	0.2	18,450	12,395	34,249	6,572
Arizona	248,228	0.8	71,020	37,333	132,454	7,421
Arkansas	95,701	0.3	31,321	15,286	5,541	43,553
California	5,813,078	18.3	943,965	1,775,199	2,494,850	599,064
Colorado	255,893	0.8	45,015	17,482	164,907	28,489
Connecticut	2,051,560	6.5	564,804	1,056,102	380,489	50,165
Delaware	37,445	0.1	10,446	5,553	4,452	16,994
District of Columbia	328,111	1.0	96,197	165,104	62,616	4,194
Florida	766,955	2.4	255,944	116,969	337,774	56,268
Georgia	799,362	2.5	60,007	30,609	576,757	131,989
Hawaii	64,170	0.2	22,210	24,162	8,745	9,053
Idaho	20,004	*	1,132	111	2,867	15,894
Illinois	919,779	2.9	419,863	166,660	108,726	224,530
Indiana	1,068,259	3.4	640,995	108,221	209,166	109,877
Iowa	247,619	0.8	95,218	65,296	40,341	46,764
Kansas	312,629	1.0	69,881	10,698	182,708	49,342
Kentucky	70,057	0.2	42,370	3,351	2,648	21,688
Louisiana	302,906	1.0	57,831	74,791	8,042	162,242
Maine	51,340	0.2	22,079	6,574	5,890	16,797
Maryland	842,527	2.7	142,558	475,230	173,460	51,279
Massachusetts	1,335,952	4.2	377,564	388,813	426,116	143,459
Michigan	918,426	2.9	637,194	60,811	133,809	86,612
Minnesota	497,994	1.6	175,086	125,263	131,626	66,019
Mississippi	162,305	0.5	36,672	57,186	10,922	57,525
Missouri	1,112,665	3.5	233,386	690,268	145,382	43,629
Montana	13,779	*	3,600	73	6,639	3,467
Nebraska	80,478	0.3	36,860	1,623	18,111	23,884
Nevada	32,028	0.1	2,896	1,787	26,438	907
New Hampshire	109,591	0.3	2,955	70,088	8,549	27,999
New Jersey	1,090,122	3.4	360,965	266,088	251,319	211,760
New Mexico	86,230	0.3	56,376	2,924	24,194	2,736
New York	2,819,153	8.9	676,350	1,168,751	632,552	341,500
North Carolina	449,331	1.4	188,313	51,252	22,163	187,603
North Dakota	83,113	0.3	40,027	199	40,704	2,183
Ohio	1,588,955	5.0	498,405	308,443	613,339	168,768
Oklahoma	158,492	0.5	23,024	6,175	81,344	47,949
Oregon	89,983	0.3	3,531	34,146	12,833	39,433
Pennsylvania	1,665,087	5.3	633,750	513,680	278,081	239,576
Rhode Island	131,722	0.4	18,241	45,718	2,284	65,479
South Carolina	176,424	0.6	16,928	17,468	10,511	131,517
South Dakota	23,315	0.1	3,747	169	17,729	1,670
Tennessee	502,168	1.6	243,561	44,047	71,969	142,591
Texas	2,291,454	7.2	845,597	316,826	769,710	359,321
Utah	169,681	0.5	39,301	20,854	85,878	23,648
Vermont	81,066	0.3	72,331	2,896	3,786	2,053
Virginia	425,487	1.3	118,527	175,209	56,621	75,130
Washington	444,368	1.4	35,331	80,242	258,825	69,970
West Virginia	149,300	0.5	92,210	10,792	7,699	38,509
Wisconsin	364,684	1.1	174,339	52,374	48,937	89,034
Wyoming	11,112	*	4,086	14	1,771	5,291

For Footnotes, see page 85.

* Less than 0.05%.

TABLE 3. NET VALUE OF MILITARY PROCUREMENT ACTIONS BY FISCAL YEAR[a]

Fiscal Years 1963, 1964 and 1965

(Amounts in Thousands)

State	Fiscal Year 1963		Fiscalo Year 1964		Fiscal Year 1965	
	Amount	Percent	Amount	Percent	Amount	Percent
TOTAL, U. S.[b]	$28,107,882		$27,470,379		$26,631,132	
NOT DISTRIBUTED BY STATE[c]	2,874,642		3,053,272		3,363,052	
STATE TOTALS[d]	25,233,240	100.0%	24,417,107	100.0%	23,268,080	100.0%
Alabama	194,990	0.8	190,681	0.8	165,176	0.7
Alaska	103,476	0.4	101,545	0.4	74,175	0.3
Arizona	285,751	1.1	173,825	0.7	176,857	0.8
Arkansas	39,114	0.2	29,731	0.1	39,284	0.2
California	5,835,670	23.1	5,100,650	21.0	5,153,639	22.1
Colorado	444,196	1.8	389,511	1.6	249,151	1.1
Connecticut	1,048,449	4.2	1,126,054	4.6	1,180,111	5.1
Delaware	47,483	0.2	30,424	0.1	38,239	0.2
District of Columbia	238,120	0.9	222,947	0.9	247,576	1.0
Florida	583,237	2.3	782,591	3.2	633,332	2.7
Georgia	423,290	1.7	520,169	2.1	662,417	2.8
Hawaii	45,206	0.2	52,112	0.2	72,218	0.3
Idaho	8,634	*	7,804	*	11,724	0.1
Illinois	486,067	1.9	429,201	1.8	421,899	1.8
Indiana	486,759	1.9	537,940	2.2	604,925	2.6
Iowa	130,406	0.5	103,392	0.4	133,951	0.6
Kansas	331,687	1.3	289,045	1.2	229,051	1.0
Kentucky	55,725	0.2	40,476	0.2	42,749	0.2
Louisiana	195,341	0.8	181,427	0.7	255,834	1.1
Maine	58,409	0.2	31,531	0.1	68,771	0.3
Maryland	606,365	2.4	547,936	2.3	584,333	2.5
Massachusetts	1,060,165	4.2	1,032,062	4.2	1,178,729	5.1
Michigan	633,047	2.5	591,290	2.4	532,897	2.3
Minnesota	273,757	1.1	217,941	0.9	259,500	1.1
Mississippi	186,039	0.7	155,911	0.6	152,188	0.7
Missouri	686,111	2.7	1,349,071	5.5	1,060,781	4.6
Montana	79,349	0.3	16,422	0.1	69,375	0.3
Nebraska	33,559	0.1	33,921	0.1	42,708	0.2
Nevada	13,143	0.1	6,361	*	19,142	0.1
New Hampshire	51,174	0.2	64,857	0.3	52,400	0.2
New Jersey	1,251,608	5.0	917,561	3.8	820,309	3.5
New Mexico	61,642	0.2	71,486	0.3	84,137	0.4
New York	2,500,146	9.9	2,496,438	10.2	2,229,473	9.6
North Carolina	258,987	1.0	278,516	1.1	288,408	1.2
North Dakota	64,855	0.3	192,025	0.8	48,997	0.2
Ohio	1,345,686	5.3	1,028,946	4.2	863,113	3.7
Oklahoma	111,204	0.5	122,489	0.5	119,808	0.5
Oregon	41,777	0.2	29,104	0.1	39,624	0.2
Pennsylvania	887,452	3.5	883,065	3.6	988,811	4.2
Rhode Island	46,970	0.2	38,173	0.2	86,323	0.4
South Carolina	57,747	0.2	51,621	0.2	81,580	0.4
South Dakota	80,630	0.3	28,308	0.1	21,062	0.1
Tennessee	183,478	0.7	193,564	0.8	197,288	0.8
Texas	1,203,123	4.8	1,294,431	5.3	1,446,769	6.2
Utah	427,679	1.7	340,040	1.4	191,173	0.8
Vermont	12,258	0.1	14,012	0.1	32,202	0.1
Virginia	484,989	1.9	690,852	2.8	469,097	2.0
Washington	1,041,581	4.1	1,085,696	4.5	545,607	2.3
West Virginia	162,201	0.7	87,327	0.4	90,812	0.4
Wisconsin	219,427	0.9	177,217	0.7	203,003	0.9
Wyoming	125,081	0.5	49,408	0.2	7,867	*

For Footnotes, see page 35.

* Less than 0.05%.

TABLE 4. NET VALUE OF CIVIL FUNCTIONS PROCUREMENT ACTIONS[f]

Fiscal Years 1963, 1964, 1965 and 1966

(Amounts in Thousands)

State	Fiscal Year 1963 Jul 62—Jun 63	Fiscal Year 1964 Jul 63—Jun 64	Fiscal Year 1965 Jul 64—Jun 65	Fiscal Yc 1966 Jul 65—Ju
TOTAL U. S.[b]	$671,880	$709,990	$847,926	$878,30
NOT DISTRIBUTED BY STATE[c]	40,634	37,753	41,020	43,53
STATE TOTALS[d]	631,246	672,237	806,906	834,76
Alabama	5,764	8,766	11,958	16,29
Alaska	825	10,599	39,516	15,80
Arizona	390	4,011	4,301	2,81
Arkansas	43,542	54,671	76,815	89,42
California	52,687	43,741	59,239	57,84
Colorado	486	135	3,702	92
Connecticut	2,843	4,647	5,476	5,19
Delaware	6,101	9,081	8,539	8,97
District of Columbia	211	2,033	887	86
Florida	21,043	28,290	27,659	26,27
Georgia	12,498	2,317	6,862	7,34
Hawaii	466	1,916	1,608	1,43
Idaho	1,252	1,500	3,060	5,82
Illinois	17,654	15,188	24,194	22,19
Indiana	9,224	14,970	22,597	25,08
Iowa	8,294	16,166	14,365	12,16
Kansas	22,637	21,304	18,248	12,884
Kentucky	39,835	28,154	19,303	20,219
Louisiana	28,725	33,279	32,156	54,921
Maine	841	1,879	2,238	1,628
Maryland	7,121	8,080	21,457	10,212
Massachusetts	10,904	12,390	11,993	5,065
Michigan	10,578	4,347	12,035	13,027
Minnesota	8,444	2,532	1,686	4,128
Mississippi	12,767	13,673	12,018	16,594
Missouri	18,141	20,144	22,756	29,790
Montana	837	83	1,100	3,774
Nebraska	5,888	4,558	8,148	8,618
Nevada	125	0	0	0
New Hampshire	562	219	2,431	1,608
New Jersey	5,850	5,784	6,803	3,803
New Mexico	3,983	724	1,117	3,748
New York	20,256	12,355	13,535	12,400
North Carolina	2,907	3,425	3,797	4,004
North Dakota	1,203	503	1,739	3,811
Ohio	15,226	25,835	17,939	15,884
Oklahoma	34,853	24,699	13,952	31,514
Oregon	31,173	48,034	74,243	86,906
Pennsylvania	33,253	36,678	41,620	37,776
Rhode Island	3,545	3,195	4,951	4,491
South Carolina	2,675	2,751	3,608	2,472
South Dakota	18,791	11,319	10,915	6,851
Tennessee	4,847	8,946	14,626	18,778
Texas	[illegible]	49,443	39,420	32,810
		0	41	565
		64	33	58
		3,770	9,364	6,360
		36,419	36,323	55,957
		25,578	33,587	23,182
		3,410	3,426	4,094
		632	20	290

Footnotes
DOD Prime Contract Awards

Footnotes.

[a] See Notes on Coverage, below.

[b] Includes all contracts awarded for work performance in the United States. The United States includes the 50 states, the District of Columbia, U. S. possessions, the Canal Zone, the Commonwealth of Puerto Rico, and other areas subject to the complete sovereignty of the United States, but does not include occupied Japanese islands and trust territories.

[c] Includes contracts of less than $10,000, all contracts awarded for work performance in the Commonwealth of Puerto Rico, U. S. possessions, and other areas subject to the complete sovereignty of the United States, contracts which are in a classified locations, and any intragovernmental contracts entered into overseas.

[d] Net value of contracts of $10,000 or more for work in each state and the District of Columbia.

[e] Other Defense agencies, formerly shown separately, are included in the figures for the Army.

[f] Civil functions of the Army Corps of Engineers for flood control and rivers and harbors work. Civil functions data are shown separately, and are not included in military functions tabulations.

[r] Revised.

Notes on Coverage

It is emphasized that data on prime contracts by state do not provide any direct indication as to the state in which the actual production work is done. For the majority of contracts with manufacturers, the data reflect the location of the plant where the product will be finally processed and assembled. If processing or assembly is to be performed in more than one plant of a prime contractor, the location shown is the plant where the largest dollar amount of work will take place. Construction contracts are shown for the state where the construction is to be performed. For purchases from wholesale or other distribution firms, the location is the address of the contractor's place of business. For service contracts, the location is generally the place where the service is performed, but for transportation and communications services the home office address is frequently used.

More important is the fact that the report refers to prime contracts only, and cannot in any way reflect the distribution of the very substantial amount of material and component fabrication and other subcontract work that may be done outside the state where final assembly or delivery takes place.

The report includes definitive contracts, and funded portions of letter contracts and letters of intent, job orders, task orders, and purchase orders on industrial firms, and also includes interdepartmental purchases, made from or through other governmental agencies, such as those made through the General Services Administration. The state data include upward or downward revisions and adjustments of $10,000 or more, such as cancellations, price changes supplemental agreements, amendments, etc.

The estimated amounts of indefinite delivery, open-end, or call type contracts for petroleum are included in the report. Except for petroleum contracts, the report does not include indefinite delivery, open-end, or call type contracts as such, but does include specific purchase or delivery orders of $10,000 or more which are placed against these contracts. Also excluded from the report are project orders, i.e., production orders issued to Government-owned-and-operated facilities such as Navy shipyards. However, the report includes the contracts placed with industry by Government-operated facilities to complete the production order.

Logistic Bridge

(Continued from Page 2)

items or if they slip in production. Rifles, trucks, radios and ammunition are well known munitions, but boats, tents and medical supplies are also vital. A year ago, we found sand bags so critical some were being delivered by air. I need not tell you of the importance of food to the troops. These items must flow from the farms and factories over that military logistic bridge through the rapidly improving but still marginally adequate sea ports of Vietnam to the troops in Bien Hoa, An Khe, Pleiku, or wherever they may be. Twenty-five thousand men of the First Logistics Command in Vietnam are the part of the logistic bridge that distributes the supplies to the Army and, in part, to other Services at that end. They issue seven million rations a month, support 17,000 vehicles and issue 28 million gallons of motor fuel. If these figures seem hard to grasp, you might consider that the Greyhound Bus fleet could expand about threefold with this support. I know you have read of the ambush problems that complicate their operations on the road and railroads. The supply and transportation troops in Vietnam are well within range of enemy combat weapons.

In my present capacity, I have a direct responsibility for this logistic bridge for the Army and to some extent for the other Services. One part of the bridge is the Defense Supply Agency. It procures for the Army about 500,000 items from American producers and suppliers. All the courage and skill of our troops will go for naught if industry doesn't provide the things to flow over that logistic bridge, so the soldier can close with the enemy with his health, his equipment and his confidence fully backed by the might of our production and delivery capability.

In closing, I should like to bring you a message from Lieutenant General Engler, Deputy Commanding General, under General Westmoreland, of the U.S. Army, Vietnam. Some of you will remember General Engler as former commander of the Army's Supply and Maintenance Command. His message is as follows:

> "To date much has been written and discussed pro and con concerning our progress here in Vietnam and the unique aspects of the fighting. I expect much more will be written or said before it is over. In reflection on the overall situation, however, I see one facet which stands out above all others. Today, as in our previous conflicts, the American soldier, as well as the members of other free world countries who fight at his side, is depending again on American industrial strength and American business know-how to give him the best possible advantage on the field of battle. From our viewpoint here in Vietnam, today's industrial community, just as its predecessors in World War I and II and in Korea did, is playing a key role in insuring that our soldiers have the best possible advantage.
>
> "The most heartening aspect of our task here is the dedication of the American soldier to the job which he must perform. Whether employing the new M-16 rifle, operating a bulldozer, unloading ships, or maintaining his equipment, his attitude is sustained by the most tangible evidence of the U.S. national effort behind him, the quality of the tools and materials provided to assist him in carrying out his missions. Those tools and materials stem from the accomplishments of the men of American business and industry.
>
> "From Vietnam we send our thanks."

Military Information Processing— Heart of Command and Intelligence Systems

by
Brig. Gen. A. T. Culbertson, USAF

The Research and Technology Division of the Air Force Systems Command (AFSC) is responsible for maintaining the broad technological base of exploratory and advanced development programs to support the acquisition of new aerospace systems. Specifically, its eight laboratories are involved in avionics, flight dynamics, materials, rocket propulsion, weapons aero-propulsion, armament and electromagnetics. One of these laboratories, the Rome Air Development Center (RADC) at Griffiss AFB, N.Y., is responsible for exploratory research and development in electromagnetics. In addition to this R&D work, RADC is involved with applying new electronic techniques to operational problems through its support to the AFSC Electronic Systems Division, the Advanced Research Projects Agency, the U.S. Army and several other Government agencies.

RADC has approximately 1,600 personnel assigned, more than half of whom are scientists, engineers, or technicians. Its annual budget, which exceeds 100 million, is applied primarily to industrial concerns through more than 1,000 R&D contracts. Real estate holdings include 16 acres of floor space at Griffiss AFB and 14 additional experimental sites within New York state. In terms of electromagnetic research experience, RADC is a venerable organization. While it has just celebrated its 15th birthday as Rome Air Development Center, its World War II origin—as Watson Laboratories near Red Bank, N.J.—harks back more than 21 years.

Essentially, the technological extent of its efforts is divided into six major program areas:

• Information processing—including advanced computer hardware and

• Reliability and compatibility—the analysis of electronic equipment design factors necessary to predict operating systems effectiveness.

• Ground-based surveillance—including general techniques applicable to the acquisition, tracking and identification of aerospace objects. (The primary surveillance emphasis at RADC is with techniques such as over-the-horizon detection, phased antenna arrays, base-line radar, navigation/guidance aids, and special ground detection equipments: site security devices, nuclear detection and assessment.)

• Ground communication technical development—including reliability, security, media exploitation, signal processing and ground environments for aerospace relays.

• Intelligence research and development—such as the extraction and processing of information from all types of reconnaissance and other collection media.

The scope of this article precludes any detailed description of all of RADC's present projects or past accomplishments. Many of the readers of the *Defense Industry Bulletin* are well aware of RADC's significant contributions to aerospace research. Information processing, one aspect of RADC's responsibility, which is expanding rapidly in scope and importance, will be described more completely. Electronic data processing (EDP) has become one of America's greatest industries, with the U.S. annual investment in EDP estimated at three billion dollars. The Defense Department, a pioneer user and developer, employs about 85 percent of Government computers. Much of our present expertise in EDP can be attributed to DOD-sponsored research programs. Certainly the present state of industrial technology could not have been achieved without the computer. I will resist any urge to predict far-ranging computer developments and the concomitant effects on technology, for events have an uncomfortable way of overtaking the predictions of the most optimistic prognosticators. At the present stage of computer usage, it is evident that computers have not only been a blessing to man, but also that the impact and evolution of new computer techniques will have a profound influence on the traditional use of computers themselves.

T. Culbertson, USAF, me Air Development .FB, N.Y. is a veteran 30 years service. He f Parks Air College, Ill., where he learned so a graduate of the

By the development of computer time-sharing techniques, the traditional barriers that have separated the potential user with a problem from a timely answer to his question are being reduced. By utilizing a computer as a device to handle non-numerical data, we are just at the threshold of a new era in computer usage—the manipulation of non-numerical data, i.e., information processing. New ways of applying the present computer art for information processing are being developed at a rapid rate. New hardware and the accompanying software programming, a little different from that of today, are being combined to better handle non-numerical information—data pertinent to future military intelligence and command and control

systems. In both of these areas, the Air Force relies on RADC for both development and application.

Regardless of application the computer art benefits from continued R&D on such basic problems as faster, cheaper, more reliable components used in the logic and memory portions of the computer. While industry is continuing general emphasis, RADC is stressing high-risk, high-payoff developments such as cryogenics and optical components, as well as components and devices for computers required to operate in unusual military environments—tactical and space, for example. Increased emphasis is being placed on programming, new computer organizations and hardware for information processing.

Today's major need is in the computer software—the programming of the computer hardware to perform its various functions. Programming costs are too high. They can, and unfortunately often do, run several times the cost of the hardware. The present high programming costs are compounded by the availability of many different types of computers, each requiring specialized programs. DOD uses computers manufactured by several different companies, with the resulting problem of language incompatibility; programs at one installation cannot be used at others if the computers are not identical. The replacement of a computer at an installation means that programs must be rewritten for the new computer. It is obvious that a need exists for machine-independent software programs—programs that are standardized on a functional basis.

Work is under way on the most efficient way to prepare the executive, or "boss," programs, which are usually furnished by the computer manufacturer and, in practice, "control" the computer. In June of this year, RADC installed the initial components of a GE 645 time-sharing computer. With this system RADC will exploit the increased capacity and flexibility of the simultaneous-multiple-user "third generation" of computers. This concept is relatively new; many and varied users physically separated from the computer can address it at the same instant. It is possible for 100 to 300 users, widely separated by geography, to utilize their own independent consoles to address the centralized computer. They should be able to use different programs (multi-programming) or bits and pieces of the same program (multi-processing) simultaneously.

The RADC time-sharing computer—in particular, the processor and the input-output controller—will be modified to develop techniques for textual (non-numerical) information handling and new concepts of program swapping between computers. In the latter it will be possible for a computer program on one computer to communicate directly with a computer program on a computer remotely located so as to share processing capability and common files of information. This extended third generation system of multiple-users and program swapping will vastly improve computer utilization, systems management and command/control, while at the same time reducing the number of computers required to provide a given level of service.

Other RADC software efforts include machine-independent programming, wherein a user would not be restricted to a specific computer model but would be able to take his program to any computer. There is much work to be done in this area, which is presently limited by the lack of a comprehensive theory of information processing and languages. Efforts are being renewed in computer standardization, with the Bureau of Standards doing an excellent job, and industry cooperating. Within the Air Force, the Electronic Systems Division of AFSC is charged with this responsibility, and RADC serves as its advisor.

We are confident that our exploratory computer efforts at RADC will lead to a reduction of programming costs and, all in all, make for more expeditious data handling which can only lead to more efficient management. We shall strive to maintain our stature as a leader in the field of computer technology.

A typical large display console within the Rome Air Development Center's Computer Science Center.

NOTICE

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Educational Technology

(Continued from Page 16)

"closed loop" which evaluates the man's suitability as a direct result of the training input.

In the instructional technology area, the Air Force has been recognized as a leader from the earliest days. Much of the total psychological research output has stemmed from Air Force efforts, along with experimental hardware that found its way into non-military education. Yet we believe that more can be accomplished by a joint effort—by joining with the Office of Education and with academic and industrial efforts. In this way we can share our knowledge and experience—tackling the promising areas together.

The Air Force can provide a significant "proving ground" for research. Our organizational structure would appear to offer excellent opportunities to determine whether one approach or another is superior. Our testing feedback can encompass not only the normal "final examination" equivalent but also performance on the job. Here is where both curriculum and instruction have to meet the ultimate test, and this has to be done on a tight time span because of the limited period during which we can get useful output from the trained man.

I have been disappointed at the lack in some circles toward the policy enunciated by Secretary McNamara for giving more of our culturally deprived youth an opportunity to benefit from military service. This policy emanates from the fact that our professional military men understand how to instill motivation and to teach military tasks to such men in a reasonable period of time. This policy will enable thousands of young men to know the satisfaction of serving their country and to be more productive members of the labor force in their post-military careers.

I should hope that all segments of our society seeking to aid marginally educated youth would recognize our objectives; that they would wish to support our efforts to continue insuring a real gain for these individuals by curriculum design and evaluation, by instructional technique improvement, and by conveying to them a feeling that someone cared enough to take them in hand.

Looking to the future, I feel confident that, in the period directly ahead, some significant progress will be made in education and training because of two major influences.

First is the closer involvement of DOD and the Military Services in the improvement of educational technology. This influence can be and must be utilized for the benefit of not just the Services alone, but for all education and training throughout the nation. Our military educational competence must be pooled with academic and industrial resources, providing an effective interchange and joint endeavors where appropriate.

The need for better educational process is so critical that we must not overlook any arrangement which will improve the national education and training effort. We in the Air Force believe that there is much to be gained by associating ourselves with competent research and development everywhere.

The second influence is the deeper involvement of industry with the problems of education and training and the use of industry resources in what has, heretofore, been considered an exclusively "public sector" task. Industry resources such as research and development, systems analysis, systems engineering and management techniques have helped us to solve some tremendous problems in other areas. If industry can help us to hurl ourselves into vast space, might we not hope to have industry help us probe mental space and maximize our contributions in this area.

This education and training is a large area to work in—larger than the Air Force and Defense areas. There is much to be done—great resources to be oriented to the tasks ahead.

My purpose is to help build the overall joint structure wherein the Air Force will join with other branches of Government, such as the Office of Education and the Department of Labor; then, seek a continuing cooperative relationship with the professional educational community and with the enlarging industrial complex that is trying to identify its appropriate roles.

We in the Air Force, in concert with the Defense Department, will continue to review our goals, structures and programs to insure ability to work together with other segments of our society to obtain the necessary results. We in the Air Force look to our new colleagues in education and industry to help us reshape these goals, if necessary; and to help us attain them in the most effective manner, not only in a military sense, but as part of the larger national education and training effort.

NOTICE

On June 14-15, representatives of the Military Services briefed industry on military training and education programs and solicited industry know-how in suggesting future improvements in the application of advanced techniques.

The National Security Industrial Association (NSIA) is planning a joint public service effort by industrialists and educators to contribute new ideas for improvement to the Military Departments. Dr. Eugene T. Ferraro, Deputy Under Secretary of the Air Force (Manpower), is representing the Defense Department in planning this project with NSIA.

New Detection Device Aids in Search of Vietnam Junk Fleet

The U. S. Navy has a new electronic detecting device which it is using in Vietnam to facilitate the search of fishing boats and other small craft for hidden enemy weapons.

The cylindrical device, called an Ordnance Locator Mark 15, makes it possible to inspect a boat quickly without having to probe into boxes, baskets and other containers on board. The process is more efficient and limits to a minimum the inconvenience caused to innocent Vietnamese fishermen.

Now rapid probes with the Mark 15 can detect rifles, automatic weapons, grenades and munitions in the varied cargoes quickly and is an integral part of the massive stop-and-search operation being conducted by Navy, Coast Guard and Vietnamese patrol craft to halt the flow of arms to the Viet Cong by sea.

The devise, developed by the Naval Ordnance Laboratory, White Oak, Md., is about the size of a broomstick. It contains two magnetometer units, an audio-readout circuit and batteries. The compact wand is waterproof, weighs about three and one-half pounds, and costs a fraction of previous devices.

ASPR Committee Case Listing

The following is a listing (revised as of Sept. 13, 1966) of the cases currently under consideration by the Armed Services Procurement Regulation (ASPR) Committee.

On items marked by asterisks, the text has been omitted to shorten the listing. The asterisks denote actions taken as shown below:

**—Case closed, no ASPR revisions resulting.*

***—Case closed, approved for printing in a subsequent ASPR revision.*

****—Case closed, approved for printing subject to further Government coordination.*

The listing includes subjects of interest to contractors but excludes cases of a minor or editorial nature, those considered sensitive, and those involving a deviation from the regulation which are processed by the ASPR Committee.

DOD Ship Repair Contract Manual. To develop a single "ship repair contract manual" for use throughout DOD, replacing the various ship repair manuals now in use by the Military Departments. Sections 1 and 2 of the proposed manual are currently in the process of coordination with the Services.

****Cost Limitation Provisions.**

****Multi-Year Procurement Procedures.**

DOD Policy on Furnishing Components, Subsystems, etc., to Contractors. To develop a DOD policy on the furnishing of components, subsystems, etc., to contractors in the procurement of weapon systems and other items of major equipment, as an initial step to the development of comprehensive ASPR coverage on the subject of advance procurement planning. The component breakout portion of this problem has been completed and issued in Revision No. 13 to the ASPR. The remaining coverage has been considered by the ASPR Committee and is currently being edited.

Weighted Average Share in Backlog. This case is to reduce contract administration and Government control of contractors who share overhead costs with the Government by having predominantly competitive contracts, fixed price contracts, or incentive contracts. Government contract administration would then be able to concentrate on those contractors with a low sharing of overhead expense with the Government. Industry comments on the contractor weighted average share (CWAS) coverage (text and cost principle applicability) have been received and evaluated. The revised coverage has been approved by the ASPR Committee for printing, subject to approval by higher authority.

Industrial Equipment Modernization and Replacement Program. To consider developing a contractual requirement for the determination of savings programs for inclusion in the ASPR. Proposed ASPR text and a contract clause for use in fixed price contracts to accomplish the foregoing have been developed and presented to the ASPR Committee for consideration.

Derivation of Technical Data Prices. To develop appropriate coverage for inclusion in the ASPR or in the DOD Pricing Training Manual, or both, with respect to the determination and collection of cost information on engineering documentation and related technical data.

Rental Charge for Use of Government Property. To consider whether the adoption of a policy of charging rent for use of Government property, across the board, would be more practical and less burdensome in assuring against competitive advantage and would result in a decline in the number of requests for use of Government property generally.

Value Engineering—Incorporation of Defense Procurement Circulars (DPC) No. 11 and No. 19 in the ASPR. To consider suggested clarifications of the Value Engineering coverage issued in DPC's No. 11 and No. 19 and to prepare appropriate ASPR language. Revised language was forwarded to industry for comment on July 29, 1966.

Air Force Procurement Circular (AFPC) No. 6. To review the Correction of deficiencies clause and the guaranty clause issued in AFPC No. 6, as modified by AFPC No. 25, to ascertain whether the clauses should be included in the ASPR. A draft of proposed ASPR coverage has been considered and is currently in the process of being edited prior to being forwarded to industry for comment.

Calculation of Under Payments and Liquidated Damages Under the Contract Work Hours Standards Act. To develop clarifying language concerning the calculation of underpayments and liquidated damages when an individual exceeds both an eight-hour day and a forty-hour week during the same payroll period in order to provide guidance on whether liquidated damages should be calculated on the basis of the number of hours worked in excess of eight per day or the number of hours worked in excess of the forty-hour week. Proposed clarifying language in this area is being coordinated with the Department of Labor.

Basic Ordering Agreements. To review the ASPR coverage on basic ordering agreements (contained in 3-410.2) to determine whether restrictions should be included in the paragraph to provide that:

- Basic ordering agreements will not be used for the procurement of major systems, major modification, or major operation and maintenance (O&M) program items, provided this limitation will not apply to unpriced "orders" for the repair of battle or crash-damaged aircraft.
- Contractors will submit cost proposals on unpriced orders within 30 calendar days from date of receipt or prior to the expenditure of not more than 30 percent of the monetary limitations on the order, whichever is earlier.
- Basic ordering agreements will provide for distribution of definitized price exhibits within 120 days of the unpriced order to which it pertains.

A proposed revised draft of ASPR coverage was considered on August 24–26 and returned to the subcommittee for further redrafting.

Industry Cost Sharing. To consider revising the ASPR policy contained in 4-208 on industry cost sharing in connection with cost-reimbursement type contracts to provide additional policy guidance for use in situations when the potential commercial sales of the contractor appear to be very substantial and provisions for costs recovery by the Government of development expenses may be appropriate.

DOD Contract Clause Book. To consider adoption of a contract clause book for DOD-wide use in light of the Navy's experience in the use of a contract clause book incorporated in contracts by reference since August 1, 1964. Action on the clause book approach has been suspended pending

the completion of a Service test which started August 1, 1966, of incorporating clauses in contracts by direct reference to ASPR clause number, title and date.

***Cost and Economic Information System (CEIS).**

Cost Principle—Depreciation. To review the depreciation guidelines and rules issued by new Revenue Procedures 65-13, and to prepare appropriate changes to ASPR 15-205.9 which may be necessary as a result of Revenue Procedures 65-13 issued by the Internal Revenue Service. Industry comments have been received and are under consideration.

Acquisition of Electronic Data Processing Equipment by Contractors and Subcontractors. To consider proposed ASPR coverage in the subject area presented by the DOD Steering Group as a result of the Defense study giving consideration to the GAO views expressed in various reports to the Congress and pending legislation (Brooks Bill), as well as the recommendations received from industry on the Moot Report. Industry comments have been received and are under consideration.

Proposed Addition to ASPR on Procurement of Privately Developed Items. To consider a proposed addition to the ASPR on the subject matter to provide guidance and instructions to contracting officers concerning the purchase of privately developed items. The recommendations presented for consideration were developed by a Defense Industry Advisory Council (DIAC) working group which had been established to determine whether the DOD program to increase price competition has had a significant adverse impact on small and medium-size private risk innovators. On June 29 DOD solicited the assistance of industry in identifying the problem, if any, to assist in the development of meaningful guidelines in this area.

Revision of DD Form 250. To consider desirability of providing uniform instructions and guidance in the ASPR with respect to DD Form 250 (Material Inspection and Receiving Report) to permit rescission of the existing and varied instructions of the Military Departments with respect to the processing of DD 250 forms. The proposed coverage, in addition, would standardize data, format and content of the DD 250 form for utilization as:

- An inspection document.
- An acceptance document.
- A shipping document.
- An advice of shipment.
- A receiving document.
- A contractor's invoice document.
- A contractor's internal use document.

The forms and instructions for use were modified to accommodate numerous comments presented by industry. As revised, the instructional material has been approved for publication upon approval by the Bureau of the Budget (BOB) of the revised form. Final action on this case is dependent upon receipt of the BOB approval.

ASPR Section for Research and Development. To consider expanding the R&D coverage in Section IV, Part 2, into a separate section giving consideration as to the scope of such coverage and how detailed the coverage should be.

***Intra-Company Transfers of "Services".** (Incorporated in Materials Cost, Interdivision Transfers).

Review of Implementation of Public Law 87-653—Defective Cost or Pricing Data. To review the current ASPR implementation of Public Law 87-653 on Cost or Pricing Data in light of the experience thus far obtained, to determine whether any changes should be made in the ASPR coverage. Industry comments on the changes to the clauses have been received and are under consideration.

Access to Records, Firm Fixed Price Contracts. To consider the recommendations of the GAO to the Secretary of Defense that the ASPR be revised to:

- Require contracting officers to evaluate the need for post-award audits where the contract was awarded on the basis of certified cost or pricing data and there is reason to believe that such data may not be accurate, complete, or current, or have not been adequately verified; and in such instances specifically to request the Defense Contract Audit Agency to make a post-award audit.

- Provide a contract clause for all negotiated contracts which exceed $100,000 (except when the price negotiated is based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by laws or regulations) to grant the contracting officer, or his authorized representatives, the contractual right to examine all data, including books, records and documents generated during the contract period, considered necessary to verify that the data submitted and used in establishing the contract price were accurate, complete and current at the time of the contract negotiation and award.

This GAO recommendation has been referred to the special subcommittee undertaking a review of the implementation of Public Law 87-653.

Contractor's Weighted Average Share in Cost Risk (CWAS) Applicable to Section XV Cost Principles. To develop revisions to the contract cost principles contained in ASPR Section XV to reflect the application of the contractor's weighted average share in cost risk to the cost principle paragraphs and subparagraphs. Industry comments on the CWAS coverage (text and cost principle applicability) have been received and evaluated. The revised coverage has been approved by the ASPR Committee for printing, subject to approval by higher authority.

Environmental Pollution Control. To consider the development of contractual coverage to implement Executive Order 11258 with respect to prevention, control and abatement of water pollution by Federal activities, and to assure that the standards established for direct Federal operations are adhered to by contractors under programs financed by the Government.

***Revision to ASPR 3-808.2(b)(1).**

Patent Costs. To consider the recommendations of a DIAC working group that ASPR 15-205.26 covering patent costs be clarified, in view of the varying interpretations of the present cost principle.

Source Selection Procedures. To consider the development of coverage for inclusion in the regulation with respect to the selection of sources, both in R&D contracts and in production contracts, which are not awarded on the basis of price competition.

Equal Employment Opportunity—Pre-Award Survey. To develop implementation of the Department of Labor directive of May 3, 1966, which requires a pre-award survey of the

prospective contractor's ability to comply with the equal employment opportunity requirements, prior to the award of a formally advertised contract or any first tier subcontract in the amount of one million dollars or more. The Labor directive which becomes effective for all Invitations For Bid for supplies issued after June 1, 1966, necessitates the issuance of the initial Defense implementation in a Defense Procurement Circular in order to comply with the effective date of the directive. Permanent implementation of the Labor Department directive will be issued at a subsequent date in the form of revisions to the ASPR.

***Contractor Team Arrangements.**

Package Procurement. To develop policy and contractual language covering the application and use of total package procurement for inclusion in the ASPR giving recognition to the fact that the coverage of this new concept will not be all inclusive in its initial publication.

Paperwork Burden on Defense Contractors. To undertake a review of the ASPR solely from the standpoint of paperwork requirements in an effort to identify areas where immediate improvements can be made to reduce such a burden on contractors.

Review of the Implementation of Public Law 87-653. To undertake a review of the ASPR implementation of Public Law 87-653 in depth on the basis of the experience thus far obtained, to determine the need for further guidance or clarification of such coverage. This review has been divided into five broad areas as follows:

- **The submission of data.** When is data submitted? Submission vs. disclosure or availability. Identification of data. Contracting officer (and other) documentation.
- **Definitions of "current" and "complete."** From the standpoint of reasonableness and practicability. How should significance be considered?
- **Examination of Records.** Audit before negotiation. Audit after contract award. Audit of subcontractor data.
- **Subcontract Problems.** Subcontracts under firm fixed price primes. Second and third tier subcontracts.
- **Significance.** From the standpoint of price negotiation vs. application of defective pricing clause. Price changes after price agreement but before contract award.

Relocation Costs — 15-205.25. To consider revising ASPR 15-205.25 covering relocation costs to specifically set forth therein guidance to Government auditors and contracting officials in the treatment to be afforded the cost of maintaining unsold homes of contractors' employees who transfer to new locations to work under Government contracts.

Cost Information Reports (CIR). To develop appropriate implementation of Cost Information Reports (CIR) covered in DOD Directive 7041.2 entitled "Cost Information Reports" and the DOD Handbook entitled "Cost Information Reports (CIR) for Aircraft, Missiles and Space Systems" for inclusion in the ASPR.

Contract Modifications. To develop a new ASPR section consolidating service material dealing with all types of contract modifications. Service comments on a draft of the proposed section are currently being evaluated.

Handbook for Procurement Quality Assurance. To prepare an ASPR supplement which will provide standardized procedures, where possible, for use of Government inspection and quality assurance personnel. A subcommittee report is currently being considered.

Industrial Production Equipment Surveillance. To prepare procedures which will require an active Government program to assure that Government-furnished industrial production equipment in possession of contractors is being effectively utilized. A subcommittee report is presently being considered.

Production Surveillance and Reporting. To prepare the initial parts of a new ASPR section dealing with the production function. This effort is confined to the activities of Government personnel in determining the status of progress on Government contracts and the reporting of the status, as required. A subcommittee report is currently under evaluation.

Transportation. To develop a new ASPR Section XIX covering transportation by expanding the existing Section I, Part 13, coverage to incorporate therein existing service material and, thereby, provide comprehensive guidance, including necessary contract clauses and provisions.

Bibliography

(Continued from Page 14)

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Modules (Integrated Circuits) for Communications, Final Report. RCA for the Army, Aug. 1966, 50 pp. Order No. AD-636 441. $2.

Investigations of Linear Beam and New Concepts of Microwave Power Generations, Vol. I. Cornell University for the Air Force, May 1966, 175 pp. Order No. AD-634 129. $5.

An Improved Sonic Anemometer-Thermometer. Stanford Research Institute, Menlo Park, Calif., for the Army, Aug. 1965, 41 pp. Order No. AD-619 996. $2.

Development of Controlled Impulse Technique for In Situ Testing of Rock. Bureau of Mines, U.S. Department of the Interior, Denver, Colo., for the Air Force, Feb. 1966, 98 pp. Order No. AD-628 860. $3.

Establishment of a Long-Period Seismograph Network Utilizing Magnetic Tape Recording. Columbia University's Lamont Geological Observatory, Palisades, N. Y., for the Air Force, June 1965, 44 pp. Order No. AD-622 794. $2.

A Shipboard Cable-Hauling System for Large Electrical Cables. Woods Hole Oceanographic Institution, Woods Hole, Mass., for the Navy, Feb. 1965, 7 pp. Order No. AD-614 071. $1.

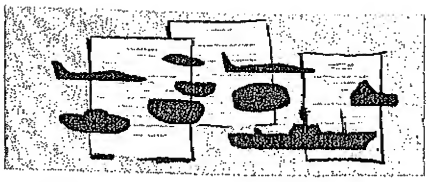
Effect of Deep Ocean Environments on the Corrosion of Selected Alloys. Naval Civil Engineering Laboratory, Port Hueneme, Calif., Oct. 1965, 18 pp Order No. AD-626 586, $2.

Study of Heat Transfer and Fouling of Heat Transfer Surfaces in the Deep Ocean. C. F. Barun & Co., Alhambra, Calif., for the Navy, Nov. 1965, 252 pp. Order No. AD-626 185. $7.

The Low Turbulence Wind Tunnel. Navy's David Taylor Model Basin, Washington, D. C., Dec. 1965, 52 pp. Order No. AD-629 917. $3.

Optical Vibration Spectra of Solids. IIT Research Institute, Chicago, Ill., for Air Force Cambridge Research Laboratories, Aug. 1965, 232 pp. Order No. AD-626 595. $6.

Government research and development reports are available to science and industry at price indicated from:
Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151
Authorized DOD contractors and grantees may obtain these documents without charge from:
Defense Documentation Center
Cameron Station
Alexandria, Va. 22314



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of September 1966:

DEFENSE ATOMIC SUPPORT AGENCY

28—General Dynamics, General Atomic Div., San Diego, Calif. $1,421,865. One-year extension of work on DASA's nuclear weapon effects test program. San Diego. DASA Hqtrs, Washington, D.C.

DEFENSE SUPPLY AGENCY

1—The Defense Personnel Support Center, Philadelphia, Pa. has awarded the following contracts for wind-resistant cotton poplin cloth:
Burlington Industries, New York City, N. Y. $4,846,800. 6,000,000 yds.
Dan River Mills, New York City, N. Y. $2,787,750. 3,500,000 yds.
J. P. Stevens & Co., New York City, N.Y. $1,630,475. 1,025,000 yds.
Prestex, Inc., New York City, N.Y. $1,356,520. 1,600,000 yds.
—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for fuel oil & gasoline:
Metropolitan Petroleum Co., New York City, N.Y., $1,553,800. 850,000 barrels of No. 6 fuel oil.
Gulf Oil Corp., Houston, Tex. $1,324,865. 60,000 gallons of regular gasoline; 308,050 barrels of heating oil and 39,700 barrels of No. 6 fuel oil.
Paragon Oil Co., Long Island City, N.Y. $1,070,295. 473,000 barrels of No. 6 fuel oil.
Standard Oil Co. of California, San Francisco, Calif. $3,246,500. 1,770,000 barrels of No. 6 fuel oil.
Union Oil Co. of California, Los Angeles, Calif. $1,614,100. 900,000 barrels of No. 6 fuel oil.
2—Hercules, Inc., Wilmington, Del. $2,923,530. 437,000 gallons of herbicide. Wilmington. Defense General Supply Center, Richmond, Va.
6—Sierra Engineering Co., Sierra Madre, Calif. $1,220,763. 15,060 combat vehicle helmets. Sierra Madre. Defense Personnel Support Center, Philadelphia, Pa.
7—Putnam Mills, New York City, N.Y. $1,178,000. 3,800,000 square yds of nylon parachute cloth. New York City. Defense Personnel Support Center, Philadelphia, Pa.
8—Mobil Oil Corp., New York City, N.Y. $26,846,275. 263,900,000 gallons of grade JP-5 jet fuel. Defense Fuel Supply Center, Alexandria, Va.
9—Bloomsburg Mills, New York City, N.Y. $1,844,842. 1,551,200 yds of nylon duck cloth. Defense Personnel Support Center, Philadelphia, Pa.
—Union Oil Co. of Calif., Los Angeles, Calif. $3,878,280. 38,304,000 gallons of grade JP-5 jet fuel. Defense Fuel Supply Center, Alexandria, Va.
12—Dow Chemical Co., Midland, Mich. $2,784,300. 870,000 gallons of herbicide. Defense General Supply Center, Richmond, Va.
—Stauffer Chemical Co., New York City, N.Y. $1,241,283. 310,252 gallons of turbine engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va.
—Royal Lubricants Co., Hanover, N.J. $1,067,865. 310,252 gallons of turbine engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va.
13—U.S. Rubber Co., Providence, R.I. $2,249,055. 4,500 fabric drums (500-gallon capacity) for liquid fuel. Defense General Supply Center, Richmond, Va.
—Seminole Mfg. Co., Columbus, Miss. $1,091,421. 384,000 pairs of men's wool serge trousers. Defense Personnel Support Center, Philadelphia, Pa.
14—J. P. Stevens & Co., New York City, N.Y. $3,760,000. 1,600,000 yds of polyester fiber and wool tropical cloth. Defense Personnel Support Center, Philadelphia, Pa.
—Pacific Mills, Division of Burlington Industries, New York City, N.Y. $2,240,200. 920,000 yds of polyester fiber and wool tropical cloth. Defense Personnel Support Center, Philadelphia, Pa.
15—Pittston Clinchfield Coal Sales Corp., New York City, N.Y. $3,036,000. 528,000 tons of bituminous coal. Defense Fuel Supply Center, Alexandria, Va.
16—Gibraltar Fabrics, Brooklyn, N.Y. $1,181,434. 5,000,500 yds of nylon netting. Defense Personnel Support Center, Philadelphia, Pa.
19—Aluminum Co. of America, Pittsburgh, Pa. $3,419,592. 10,362,40 pounds of aluminum powder. Pittsburgh. Defense General Supply Center, Richmond, Va.
—Valley Metallurgical Processing Co., Essex, Conn. $1,677,304. $5,187,400 pounds of aluminum powder. Essex. Defense General Supply Center, Richmond, Va.
20—Bristol Mfg. Corp., Bristol, R.I. $1,530,192. 420,330 pairs of men's overshoes. Defense Personnel Support Center, Philadelphia, Pa.
—Morris Bros., Inc., New York City, N.Y. $1,454,184. 2,078,000 cotton bath towels. Defense Personnel Support Center, Philadelphia, Pa.
21—Prestex, Inc., New York City, N.Y. $3,760,306. 5,244,165 square yds. of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa.
—Mount Vernon Mills, Baltimore, Md. $1,223,999. 2,000,000 square yds. of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa.
22—Consolibag, Inc., Philadelphia, Pa. $2,086,588. 6,001,000 burlap sandbags and 3,350,000 osnaburg sandbags. Defense General Supply Center, Richmond, Va.
—Crowley Industrial Bag Co., Crowley, La. $1,888,781. 7,000,000 osnaburg sandbags. Defense General Supply Center, Richmond, Va.
—Cavalier Bag Co., Lumberton, N.C. $1,129,050. 25,000 burlap sandbags and 4,500,000 osnaburg sandbags. Defense General Supply Center, Richmond, Va.
23—Raytheon Co., Microwave & Power Tube Div., Waltham, Mass. $1,919,158. 13,026 electron tubes of various types. Defense Electronics Supply Center, Dayton, Ohio.
26—Society Brand Hat Co., St. Louis, Mo. $1,139,627. 999,980 hot weather field caps. Defense Personnel Support Center, Philadelphia, Pa.
—M&B Headwear, Richmond, Va. $1,125,000. 1,000,000 hot weather field caps. Defense Personnel Support Center, Philadelphia, Pa.
—Saddler Textiles, New York City, N.Y. $1,097,069. 432,665 yds of wind, water and fire resistant cotton sateen cloth. Defense Personnel Support Center, Philadelphia, Pa.
27—DeRossi & Sons, Vineland, N.J. $3,039,750. 175,000 wool serge coats. Defense Personnel Support Center, Philadelphia, Pa.
28—J. H. Rutter-Rex Mfg. Co., New Orleans, La. $1,043,532. 750,000 men's polyester and cotton shirts. Defense Personnel Support Center, Philadelphia, Pa.
—C.F. & I. Steel Corp., Denver, Colo. $1,550,774. 185,200 spools of barbed wire. Denver. Defense Construction Supply Center, Columbus, Ohio.
—U.S. Steel Corp., Cincinnati, Ohio. $1,490,400. 144,000 spools of barbed wire. Cincinnati. Defense Construction Supply Center, Columbus, Ohio.
—Firestone Tire & Rubber Co., Akron, Ohio. $5,124,205. 722 sets of runway membranes and 1,000 sets of taxi membranes. Akron. Defense Construction Supply Center, Columbus, Ohio.
30—Reeves Bros., Inc., New York City, N.Y. $2,684,824. 467 sets of runway membranes and 300 sets of taxiway membranes. New York City. Defense Construction Supply Center, Columbus, Ohio.

CONTRACT LEGEND
Contract information is listed in the following sequence: Date—Company—Value—Material or work to be Performed—Location Work Performed—Contracting Agency.

ARMY

1—Cessna Aircraft Co., Wichita, Kan. $1,007,467. Modernizing and modifying the O-1A aircraft to the O-1G configuration. Wichita. Army Aviation Materiel Command, St. Louis, Mo.
—Bell Helicopter Co., Hurst, Tex. $44,337,858. UH-1D helicopters. Hurst. Army Aviation Materiel Command, St. Louis, Mo.
—McDonnell Aircraft, St. Louis, Mo. $3,000,000. Continued engineering development for the medium anti-tank/assault weapon. St. Louis. Army Missile Command, Huntsville, Ala.
—Presto-lite Co., Toledo, Ohio. $1,020,638. 25 AMP generators for ¼, ¾ and 2½ ton trucks. Bay City, Mich. Army Tank Automotive Center, Warren, Mich.
—Mansfield Tire & Rubber Co., Mansfield, Ohio. $1,484,102. 42,162 pneumatic tires. Mansfield. Army Tank Automotive Center, Warren, Mich.
2—Chrysler Corp., Detroit, Mich. $44,000,000. M60IE2 tanks, M728 combat engineer vehicles and (armored vehicle launcher bridge) AVLB chassis. $3,500,000. XM37 turret trainers. Warren, Mich. Army Weapons Command, Rock Island, Ill.
6—Gary Excavating, Inc., Branford, Conn. $1,343,745. Work on the Sucker Brook Dam and Reservoir Project. Winsted, Conn. Engineer Div., New England, Waltham, Mass.
7—Epsco, Inc., Westwood, Mass. $1,022,000. Mobile tracking systems, ground stations and airborne transmitter/telemetry sets. Westwood. Army Missile Command, Huntsville, Ala.
—Bauer Dredging Co., Port Lavaca, Tex. $1,038,196. Work on the Mississippi River-Gulf Outlet Project. St. Bernard and Plaquemine parishes in Louisiana. Engineer Dist., New Orleans, La.
—Gardner Construction Co., Oak Park, Ill. $1,281,551. Construction of an automatic data processing building, with utilities, at the Army Ammunition Plant, Joliet, Ill. Engineer Dist., Chicago, Ill.
8—Oregon-Washington Railroad & Navigation Co. and Union Pacific Railroad Co., Portland, Ore. $2,700,000. Work on the Little Goose Lock and Dam and the Granite Lock and Dam on the Snake River. Between Riparia, Wash. and Lewiston, Idaho. Engineer Dist., Walla Walla, Wash.
—Eltra Corp., Presto-lite Co. division, Toledo, Ohio. $1,329,234. 25-AMP generators for cargo trucks. Bay City Mich. Army Tank Automotive Center, Warren, Mich.
—Standard Products Co., Cleveland, Ohio. $2,051,101. Track shoes for the M114 armored reconnaissance vehicle. Port Clinton, Ohio. Army Tank Automotive Center, Warren, Mich.
—Texas Instruments, Inc., Dallas, Tex. $1,000,000. Classified electronics equipment. Dallas. Army Electronics Command, Fort Meade, Md.
9—AVCO Corp., Richmond, Ind. $2,340,710. Bomb components. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.
12—Western Electric, New York City, N.Y. (1) $256,581,512. Continued Nike X research development and testing. Burlington and Greensboro, N.C. (2) $8,686,080. Nike X research and development facilities. Whippany, N.J. (3) $12,884,296. Continued Nike production planning and production engineering. Greensboro and Burlington, N.C. Nike X Project Office, Redstone Arsenal, Ala.
—L.T.V. Electro Systems, Greenville, S.C. $2,070,000. Services and material for the development of engineering change proposals and modification work orders in the manufacture of kits for U-1, U-6 and U-8 aircraft. Greenville. Army Aviation Command, St. Louis, Mo.

—General Motors, Detroit, Mich. $1,425,630. Services for reactivation, rehabilitation and procurement of production equipment for the St. Louis, Mo., Army Ammunition Plant for the production of 105mm shells. Amunition Procurement & Supply Agency, Joliet, Ill.

—Koppers Co., New York City, N.Y. $1,590,-667. Work on a flood protection project near Scranton, Pa. Engineer Dist., Baltimore, Md.

14—Atlantic Gulf & Pacific and Construction Aggregates Corp., New York City, N.Y. $2,008,702. Work on the Inland Waterways, Delaware River and Chesapeake Bay Project. St. George, Del. Engineer Dist., Philadelphia, Pa.

15—Stewart-Warner Corp., Indianapolis, Ind. $1,211,076. Metal parts for ordnance items. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Instrument Corp., Chicopee Falls, Mass. $1,276,327. Bomb components. Chicopee Falls. Ammunition Procurement & Supply Agency, Joliet, Ill.

—AVCO Corp., Stratford, Conn. $2,900,662. T-55-L 7 engines for support of CH 47 aircraft program. $14,278,000. T 53 L-11/13 turbine aircraft engines for the FY 67 UH 1D and AH-1G aircraft program. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—General Motors, Ypsilanti, Mich. $2,900,-000. Facilities for the manufacture of 20mm automatic guns. Ypsilanti. Army Weapons Command, Rock Island, Ill.

19—Zenith Radio Corp., Chicago, Ill. $1,357,-668. Rocket fuzes (M412). Chicago. Ammunition Procurement & Supply Agency, Joliet, Ill.

20—Bell Aerospace Corp., Fort Worth, Tex. $1,872,000. UH 1E helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

21—Raytheon Co., Norwood, Mass. $9,097,605. Communication system components. North Dighton, Mass. Army Electronics Command, Philadelphia, Pa.

—Chris Berg, Inc., Seattle, Wash. $1,303,-080. Demolition and construction work at Kodiak, Alaska. Engineer Dist., Anchorage, Alaska.

—General Electric, Schenectady, N.Y. $1,-738,864. Design, manufacture, delivery, installation, and test of three KVA generators and appurtenances. Schenectady, N.Y. and West Point, Ga. Engineer Dist., Savannah, Ga.

—Page Communications Engineers, Inc., Washington, D.C. $1,280,000. Work on a communications system in Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

22—Northeast Construction Co. of West Virginia, Albuquerque, N.M. $3,000,950. Expansion of training facilities at Fort Gordon, Ga. Engineer Dist., Savannah, Ga.

23—Sperry Rand Corp., New York City, N.Y. $11,102,064. M18 mines, 105mm metal parts and maintenance activities. Louisiana Army Ammunition Plant, Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.

—National Gypsum, Buffalo, N.Y. $1,009,105. Maintenance and support services at Kansas Army Ammunition Plant, Parsons, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Mason & Hanger, Silas Mason Co., Lexington, Ky. $11,590,393. 750-lb. bombs and maintenance and support activities at Corn Husker Army Ammunition Plant, Grand Island, Neb. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Ravenna Arsenal, Inc., Division of the Firestone Tire & Rubber Co., Akron, Ohio. $2,889,467. Maintenance and support services at Ravenna Army Ammunition Plant, Ravenna, Ohio. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Federal Cartridge Co., Minneapolis, Minn. $8,951,860. Small arms ammunition and maintenance and support services at the Twin Cities Army Ammunition Plant, Minneapolis, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $22,800,000. CH54A helicopters. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—Kentron Hawaii, Ltd., Honolulu, Hawaii. $5,188,130. Operation and maintenance of technical facilities at Kwajalein Test Site, Marshall Islands. Nike-X Project Office, Redstone Arsenal, Huntsville, Ala.

26—Norair Engineering Corp., Washington, D.C. $1,884,520. Construction of a one-story administration building and five prefabricated metal shop-buildings at Aberdeen Proving Grounds, Md. Engineer Dist., Baltimore, Md.

27—Ford Motors, Highland Park, Mich. $6,878,-875. ¼-ton utility trucks. Highland Park. Project Manager, General Purpose Vehicles, Warren, Mich.

28—General Electric, Burlington, Vt. $5,336,-347. $2,249,825. 7.62mm aircraft machine guns, pods, support equipment, repair parts and special tooling. Burlington. Army Weapons Command, Rock Island, Ill.

—Standard Container, Inc., Montclair, N.J. $1,749,891. Ammunition boxes. Homerville, Ga. Frankford Arsenal, Pa.

—General Motors, Cleveland, Ohio. $1,053,-484. Arm and housing assemblies for the M-114 carrier command post. Cleveland. Army Tank Automotive Center, Warren, Mich.

—Atwood Vacuum Machine Co., Rockford, Ill. $1,899,497. 20mm metallic belt links, Rockford. Frankford Arsenal, Pa.

—Menominee Engineering Corp., Menominee, Mich. $1,783,600. Bridge component parts. Menominee. Army Mobility Equipment Command, St. Louis, Mo.

—Varo, Inc., Garland, Tex. $3,370,020. Periscopes and related components for the armored reconnaissance assault vehicle. Garland. Frankford Arsenal, Pa.

—Atlantic Research Corp., Alexandria, Va. $1,134,771. Computer program for the Army Electronics Proving Ground support facility at Fort Huachuca, Ariz. Army Electronic Proving Ground.

29—Harvey Aluminum, Inc., Torrance, Calif. $1,379,638. 20mm incendiary projectiles. Torrance. Frankford Arsenal, Pa.

—Western Electric, New York City, N.Y. $1,203,303. Operation and maintenance of radars at the White Sands Missile Range, N.M. Army Missile Command, Huntsville, Ala.

—Western Electric, New York City, N.Y. $2,006,000. Nike Hercules modification kits. Burlington, N.C. Army Missile Command, Huntsville, Ala.

—S. S. Mullen, Inc., Seattle, Wash. $1,315,-300. Work on the Walla Walla River Project, Milton, Ore. Engineer Dist., Walla Walla, Wash.

—Zeller Corp., Defiance, Ohio. $2,372,062. 20mm incendiary projectiles. Defiance. Frankford Arsenal, Pa.

—Thomas Construction Co., St. Joseph, Mo. $1,381,600. Erection of 36 prefabricated buildings at Fort Leonard, Wood, Mo. Engineer Dist., Kansas City, Mo.

30—Remington Arms Co., Bridgeport, Conn. $21,382,850. 20mm cartridges and for operation and maintenance activities at Lake City Army Ammunition Plant, Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—U.S. Rubber Co., New York City, N.Y. $22,048,735. Explosives and for maintenance and support services at the Army Ammunition Plant, Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Day & Zimmerman, Inc., Philadelphia, Pa. $23,439,183. Ammunition components and for operation and maintenance activities at the Lone Star Army Ammunition Plant, Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Olin Mathieson Chemical Corp., New York City, N.Y. $1,007,887. Maintenance and support services at the Alabama Army Ammunition Plant, Childersburg, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Harvey Aluminum Sales Co., Inc., Torrance, Calif. $2,608,500. Classified ammunition items and for operation and maintenance activities at the Army Ammunition Plant, Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—U.S. Time Corporation, Waterbury, Conn. $8,908,000. Artillery shell fuzes. Watertown. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Raytheon Co., Bristol, Tenn. $3,483,360. 750-lb bomb components. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Wright Chemical Corp., Acme, N.C. $1,-600,800. Production of explosives. Acme. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Union Carbide Corp., New York City, N.Y. $1,721,658. Dry batteries for the AN/PRC-8, 9 and 10 portable radio sets. Chemway, N.C. Army Electronics Command, Philadelphia, Pa.

—Hughes Tool Co., Culver City, Calif. $1,-739,838. Light observation helicopters, related publications and special tools. $9,-316,747. OH-6A helicopters. Culver City. Army Aviation Materiel Command, St. Louis, Mo.

—Bell Aerospace Corp., Fort Worth, Tex. $1,238,500. An armament system and for training devices for the AH-1G helicopter. Fort Worth. Army Aviation Materiel Command, St. Louis.

—Harwell-Kilgore Corp., Toone, Tenn. $1,-306,739. Smoke canisters for 155mm shells. Toone, Edgewood Arsenal, Md.

—Collins Radio Co., Cedar Rapids, Iowa. $1,463,118. Aircraft navigational sets. Cedar Rapids. Army Electronics Command, Fort Monmouth, N.J.

—General Motors, Cleveland, Ohio. $3,846,-563. Extension of production engineering services in support of the armored reconnaissance airborne assault vehicle M551, General Sheridan. Cleveland. Army Weapons Command, Rock Island, Ill.

—General Dynamics Corp., Pomona, Calif. $3,933,182. FY 1967 Redeye weapons system engineering services. Pomona. Army Missile Command, Huntsville, Ala.

—LFE Electronics, Boston, Mass. $2,192,820. Navigation sets. Danvers, Mass. Army Electronics Command, Philadelphia, Pa.

—Condec Corp., Stamford, Conn. $5,941,338. 10-ton tractor trucks. Stamford. Army Tank Automotive Center, Warren, Mich.

—Beech Aircraft Corp., Wichita, Kan. $9,-789,081. Utility aircraft. Wichita. Army Aviation Materiel Command, St. Louis, Mo.

—Teledyne, Inc., El Monte, Calif. $8,039,980. Metallic belt links for 20mm cartridges. El Monte. Frankford Arsenal, Pa.

NAVY

1—Interstate Electronics Corp., Anaheim, Calif. $5,250,000. Test instrumentation on the Poseidon missile. Anaheim. Special Projects Office.

2—R.C.A., Camden, N.J. $10,786,168. Management, operation, maintenance and support of the Atlantic Undersea Test and Evaluation Center for three years. Andros Island in the Bahamas. Naval Ship Systems Command.

—York Corp., York, Pa. $1,039,336. 12 refrigerator air conditioning units for installation on naval ships. York. Naval Ships Systems Command.

6—North American Aviation, Columbus, Ohio. $14,719,000. Work on the Condor missile system. $8,027,808. Conversion of A-5A aircraft to RA-5C configuration. Columbus. Naval Air Systems Command.

—North American Aviation, Anaheim, Calif. $1,467,021. Components of bombing and navigation systems for aircraft. Anaheim. Navy Aviation Supply Office, Philadelphia, Pa.

—Litton Systems, Woodland Hills, Calif. $5,076,305. Components for aircraft navigation system. Woodland Hills. Naval Air Systems Command.

—Douglas Aircraft, Long Beach, Calif. $3,-125,408. Bomb racks and adapter kits. Torrance, Calif. Naval Air Systems Command.

—May Aluminum, El Campo, Tex. $1,078,786. Replacement mat and pallet assemblies for AM-2 airfield matting. El Campo. Navy Air Engineering Center, Philadelphia, Pa.

8—United Aircraft, Windsor Locks, Conn. $2,130,602. Propeller systems for C-130 aircraft. Windsor Locks. Naval Air Systems Command.

—Raytheon Co., Lexington, Mass. $6,000,000. Long lead time materials and effort for Sparrow missiles for the Air Force. Lowell, Mass. Naval Air Systems Command.

9—Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. $12,000,000. Long lead time services and supplies in support of FY 68 procurement of EA-6B aircraft. Bethpage. Naval Air Systems Command.

12—Sperry Gyroscope Co., Syosset, L.I., N.Y. $1,670,000. Navigation control consoles for submarine inertial navigation systems. Syosset. Naval Ship Systems Command.

—United Aircraft, East Hartford, Conn. $2,-103,009. Spare parts for J84-WE-84/86 aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.

13—General Electric, Washington, D.C. $5,571,-174. Operational support engineering services for Polaris MK80/MK84 fire control systems and for support equipment for Polaris fire control systems and Polaris MK1/MK2 guidance systems. Pittsfield, Mass. Special Projects Office.

—Newport News Shipbuilding & Dry Dock Co., Newport News, Va. $16,506,018. Pro-

pulsion plant components. Newport News. Naval Ship Systems Command.
14—General Dynamics Corp., Groton, Conn. $1,000,000. Overhaul and refueling of the Fleet Ballistic Missile Submarine USS Alexander Hamilton (SSBN-617). Groton.
—General Ship and Engine Works, Inc., Boston, Mass. $4,576,920. Construction of 6 landing craft, utility (LCU). East Boston, Mass. Naval Ship Systems Command.
15—Newport News Shipbuilding & Dry Dock Co., Newport News, Va. $3,000,000. Overhaul and refueling of the fleet ballistic missile, submarine USS Thomas Jefferson (SSBN-618). Newport News. Naval Ship Systems Command.
16—Westinghouse Electric, Baltimore, Md. $16,-836,680. Long lead time items for the MK 48 torpedo. Baltimore. Naval Ordnance Systems Command.
—Douglas Aircraft, Long Beach, Calif. $5,-532,074. Spare parts for aircraft ordnance racks. Long Beach. Navy Aviation Supply Office, Philadelphia, Pa.
—AAI Corp., Cockeysville, Md. $1,665,359. Gun mounts for assault support patrol boats. Cockeysville. Naval Ordnance Systems Command.
—General Electric, Cincinnati, Ohio. $1,645,-113. Parts for J79-GE-10 engines. Cincinnati. Navy Aviation Supply Office, Philadelphia, Pa.
—Cameron Iron Works, Houston, Tex. $1,-335,568. Igniter assemblies and spare parts for the Terrier missile. Houston. Naval Ordnance Plant. Louisville, Ky.
—Willamette Iron & Steel Co., Portland, Ore. $1,082,000. Overhaul and repair of the oiler USS Chipola (AO-63). Portland. Industrial Manager, 13th Naval District.
19—General Electric, Cincinnati, Ohio. $5,232,-944. Spare parts for J79GE10 engines for F-4J aircraft. Cincinnati. Navy Aviation Supply Office, Philadelphia, Pa.
—Bell Aerospace Corp., Fort Worth, Tex. $4,476,337. Hub assemblies, rotary blades and transmissions for UH-1E aircraft. Fort Worth. Navy Aviation Supply Office, Philadelphia, Pa.
—Curtiss Wright Corp., Wood-Ridge, N.J. $2,916,314. Spare parts for R1820 and R3350 aircraft engines. Wood-Ridge. Navy Aviation Supply Office, Philadelphia, Pa.
20—McDonnell Aircraft, St. Louis, Mo. $1,248,-900. Strut assemblies for F-4 aircraft. St. Louis. Navy Aviation Supply Office, Philadelphia, Pa.
21—Curtiss-Wright Corp., Wood-Ridge, N.J. $2,163,469. Components for aircraft engines. Wood-Ridge. Navy Aviation Supply Office, Philadelphia, Pa.
—Giannini Controls Corp., Fairfield, N.J. $1,889,521. Components of air data computer systems for aircraft. Fairfield. Navy Aviation Supply Office, Philadelphia, Pa.
22—Kaman Aircraft Corp., Colorado Springs, Colo. $1,210,870. Research & development on the Polaris missile re-entry system. Colorado Springs. Special Projects Office.
23—North American Aviation, Columbus, Ohio. $1,944,800. Overhaul and conversion of T-28A aircraft to a modified T-28B configuration. Columbus. Naval Air Systems Command.
—Hughes Aircraft, Culver City, Calif. $82,-000,000. Installation funding for the Phoenix missile system. Culver City. Naval Air Systems Command.
26—United Aircraft, East Hartford, Conn. $70,-157,633. TF-30-P-8 engines. $4,075,780. J52-P-8A engines. East Hartford. Naval Air Systems Command.
—Sperry Rand Corp., Univac Div., St. Paul, Minn. $4,750,000. Tactcal data systems. St. Paul. Naval Ship Systems Command.
—Sperry Gyroscope Co., Syosset, L.I., N.Y. $1,444,590. Computer modification kits for installation aboard Polaris submarines. Syosset. Naval Ship Systems Command.
—Westinghouse Electric, Baltimore, Md. $11,618,234. Airborne radar sets for the Air Force. Baltimore. Naval Air Systems Command.
27—United Aircraft, Stratford, Conn. $1,636,-000. Initial spares for CH-53A aircraft. Stratford. Navy Aviation Supply Office, Philadelphia, Pa.
—LTV Aerospace Corp., Dallas, Tex. $1,422,-096. Procurement and fabrication of necessary parts for the F-8E aircraft modification program. Dallas. Naval Air Systems Command.
—Litton Systems, Inc., Silver Spring, Md. $2,007,324. Radar jammers and related equipment. College Park, Md. Naval Air Systems Command.
—PRD Electronics, Inc., Westbury, N.Y. $1,300,000. Research and development on avionics shop test equipment. Westbury. Naval Air Systems Command.
—Loral Electronics Systems, Bronx, N.Y. $1,909,469. Design, development and fabrication of test models of radio receiving equipment. Bronx. Naval Air Systems Command.
—Parzen Research, Inc., Westbury, L.I., N.Y. $1,544,024. Receiver multicouplers with miniaturized antenna and repair parts for installation on naval surface ships. Westbury. Naval Ship Systems Command.
28—Aerojet General Corp., Azusa, Calif. $1,-142,400. Accessories for use in air drop of torpedoes. Azusa. Naval Ordnance Systems Command.
—Tracor, Inc., Austin, Tex. $1,884,234. Chaff dispensers. Austin. Naval Air Systems Command.
29—United Aircraft, East Hartford, Conn. $3,843,244. Spare parts to support the J-48 engine on the F-9F fighter aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.
—Clevite Corp., Cleveland, Ohio. $1,794,800. Investigation and preliminary development of a guidance and homing system adaptable to the MK 48 torpedo weapon system. Cleveland. Naval Ordnance Systems Command.
—Dirilyte Co. of America, Kokomo, Ind. $2,-323,600. Fin blades for 2.75-inch rocket motors. Kokomo. Navy Ships Parts Control Center, Mechanicsburg, Pa.
30—Lockheed Missiles & Space Co., Sunnyvale, Calif. $5,402,588. Facilities required for the fabrication, engineering, test and check-out of Poseidin development missiles. $2,491,295. Data reduction and data processing facilities for Poseidon. $1,210,-582. Polaris A-3 missile support equipment. Burbank, Calif. Special Projects Office.
—United Aircraft Corp., Stratford, Conn. $3,869,816. CH-3E and HH-3E helicopters for the Air Force. Stratford. Naval Air Systems Command.
—I.T.T., Paramus, N.J. $1,858,467. Computer systems programs for the Fleet Computer Program Center, Atlantic. Dam Neck, Va. Navy Purchasing Office, Washington, D.C.
—Goodyear Aerospace Corp., Akron, Ohio. $1,050,000. Production of units of radarscope interpretation trainer devices. Akron. Naval Training Device Center, Orlando, Fla.
—Douglas Aircraft Co., Long Beach, Calif. $20,073,972. TA-4E aircraft. Long Beach. Naval Air Systems Command.

AIR FORCE

1—General Electric, Cincinnati, Ohio. $4,-850,000. Design, investigation and feasibility demonstration of a high stage loading gas turbine engine. $4,231,000. Development work on a high temperature gas turbine engine. Cincinnati. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.
—Honeywell, Inc., Hopkins, Minn. $3,569,-404. Production of aircraft bomb components. Hopkins. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
2—Boeing Co., Wichita, Kan. $1,210,914. Stability and flight control system evaluation program for B-52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
—Fairchild Hiller Corp., Farmingdale, N.Y. $1,067,800. Engineering and production of modification kits and spare parts for F-105 aircraft. Farmingdale. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
—Aircraft Hydroforming, Inc., Gardena, Calif. $1,274,728. Production of aircraft pylon bomb rack assemblies. Gardena. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
—General Dynamics, San Diego, Calif. $1,-500,000. Production, integration and launch of space vehicles. San Diego. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
—General Electric, Waynesboro, Va. $1,058,-000. Production of electrical equipment for C-141 aircraft. Waynesboro. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Westinghouse Electric Corp., Baltimore, Md. $2,900,000. Engineering services and production of electronic counter-measure equipment. Baltimore. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Westinghouse Electric Corp., Baltimore, Md. $2,200,000. Production of low frequency sets. Baltimore. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.
—North American Aviation, Los Angeles, Calif. $1,550,000. Development work on a vertical take-off and landing (VTOL) aircraft. Los Angeles. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.
6—North American Aviation, Canoga Park, Calif. $2,210,001. Work on a development program for high performance rocket engines. Canoga Park. Air Force Flight Test Center, Edwards AFB, Calif.
—North American Aviation, Anaheim, Calif. $2,500,000. Spare parts for the Minuteman guidance control system. Anaheim. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
—Sylvania Electric Products, Waltham, Mass. $1,000,000. Technical manuals for ground electronic systems. Buffalo, N. Y., Needham and Waltham, Mass. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
—United Aircraft, West Palm Beach, Fla. $2,095,001. Work on a development program for high performance rocket engines. West Palm Beach, Fla. Air Force Flight Test Center, Edwards AFB, Calif.
7—General Electric, Syracuse, N.Y. $1,356,253. Design and fabrication of advanced ballistic missile guidance equipment. Syracuse. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
8—General Electric, Philadelphia, Pa. $1,600,-000. Flight testing of the Maneuvering Ballistic Re-entry Vehicle, Philadelphia. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
—Applied Technology, Inc., Palo Alto, Calif. $1,893,612. Electronics systems for F-105 aircraft. Palo Alto. Warner Robins Air Material Area, (AFLC), Robins AFB, Ga.
—Sundstrand Corp., Rockford, Ill. $1,446,357. Production of engine starter cartridges for F-4 aircraft. Rockford. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—United Aircraft, East Hartford, Conn. $1,003,945. Production of spare parts for R-4360 aircraft engines. $1,020,000. Research work on a supersonic ramjet engine. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
—Dynalectron Corp., Fort Worth, Tex. $1,-000,000. Repair and maintenance of F-4C aircraft. George AFB, Calif. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
9—Fairchild Corp., Farmingdale, L.I., N.Y. $1,354,685. Modification and flight testing of the F-105 aircraft to accomodate the Walleye missile. Farmingdale. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
12—Spacecraft, Inc., Huntsville, Ala. $1,500,-000. Work on the Titan III instrumentation system. Huntsville. Space Systems Div., (AFSC), Los Angeles, Calif.
—AiResearch Mfg. Co., Phoenix, Ariz. $3,-750,000. Production of gas turbine engines. Phoenix. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
—United Aircraft, East Hartford, Conn. $1,260,716. Spare parts for J-57 aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
—General Electric, Arkansas City, Kan. $2,693,471. Overhaul of J-85 aircraft engines. Arkansas City. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
—Sundstrand Corp., Rockford, Ill. $1,169,-014. Production of spare parts for electrical generators for C-141 aircraft. Rockford. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
13—Ryan Aeronautical Co., San Diego, Calif. $4,500,000. Aerial target drones and support equipment. San Diego. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Lockheed Missiles & Space Co., Sunnyvale, Calif. $1,928,875. Engineering support for the Agena booster system. Sunnyvale. Space Systems Div., (AFSC), Los Angeles, Calif.
—Boeing Co., Seattle, Wash. $2,900,000. Aerospace ground equipment, spares, technical publications and data in support of Minuteman II programs. Seattle. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

14—General Electric, Syracuse, N.Y. $1,738,636. Support services for Air Force and NATO programs at the Eastern and Western Test Ranges. Syracuse, N.Y., Patrick AFB, Fla. and Vandenberg AFB, Calif. Space Systems Div., (AFSC), Los Angeles, Calif.

—Gary Aircraft Corp., Victoria, Tex. $1,122,068. Inspection and repair as necessary of C-54 aircraft. Victoria. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—Hello Aircraft Corp., Pittsburg, Kan. $1,200,000. U-10D aircraft. Pittsburg. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Boeing Co., Wichita, Kan. $1,776,000. Design, production and test of a generator system for B-52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Fairchild Hiller Corp., Farmingdale, N.Y. $4,124,000. Engineering design services related to the F-105D aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

15—Mitre Corp., Bedford, Mass. $16,680,602. Research and development for system engineering and technical direction in the field of command and control systems. Bedford. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

—United Technology Center, Sunnyvale, Calif. $1,230,000. Procurement of TITAN III Manned Orbiting Laboratory (MOL) long lead hardware for solid rocket motors. Sunnyvale. Space Systems Div., (AFSC), Los Angeles, Calif.

16—Lear Siegler, Inc., Santa Monica, Calif. $2,473,450. Production of components of a flight control system to support a target missile. Santa Monica. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

19—Bendix Corp., Teterboro, N.J. $2,450,288. Navigational computer sets for F-4 aircraft. Teterboro. Aeronautical Systems Div., (AFSC), Wright-Patterson, AFB, Ohio.

—General Electric, Burlington, Vt. $1,111,033. Spare parts for aircraft armament, Burlington. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

20—Cutler Hammer, Inc. Deer Park, L.I., N.Y. $1,000,000. Work on a flight test program for overland radar systems. Deer Park. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—United Aircraft, East Hartford, Mass. $1,068,287. Production of spare parts for J-57, J-75, and TF-33 aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

21—Hallicrafters Co., Chicago, Ill. $1,820,100. Production of components for aircraft radar altimeters. Chicago. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

22—Boeing Co., Seattle, Wash. $4,432,800. Production of components for a combat crew trainer system in support of the Minuteman missile. Seattle. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—Philco Corp., Palo Alto, Calif. $2,048,107. Work on a satellite control network. Palo Alto. Air Force Space Communications Facility, (AFSC), Los Angeles, Calif.

23—Stewart-Warner Corp., Chicago, Ill. $1,433,520. Production of electronic equipment for F-4C and F-101 aircraft. Chicago. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Boeing Co., Wichita, Kan. $2,250,000. Evaluation of flight control characteristics. Wichita. Wright-Patterson AFB, Ohio.

—Honeywell, Inc., Boston, Mass. $1,320,348. Procurement of aircraft landing systems. Wright-Patterson AFB, Ohio.

26—Fairchild Hiller Corp., Farmingdale, L.I., N.Y. $1,080,000. Work on a fire control system for F-105 aircraft. Farmingdale. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

—Douglas Aircraft, Santa Monica, Calif. $1,070,220. Components for Genie rockets. Santa Monica. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—Chicago Aerial Industries, Barrington, Ill. $8,850,871. Camera systems, lens cone assemblies, spare parts and data. Barrington. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Hughes Aircraft, Culver City, Calif. $1,352,900. Engineering services for testing and evaluation of F-102 and F-106 aircraft. Holloman AFB, N.M. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

28—AVCO Corp., Wilmington, Mass. $3,000,000. Re-entry vehicle technology. Wilmington. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—Hayes International Corp., Birmingham, Ala. $2,845,600. Inspection and repair as necessary (IRAN) of C-130 aircraft. Birmingham. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—Boeing Co., Seattle, Wash. $2,111,292. Aerospace ground equipment, spares, technical publications and data in support of the Minuteman II program. Seattle. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—United Aircraft Corp., Stratford, Conn. $1,005,100. Spare parts for H-3 type helicopters. Stratford. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—General Dynamics, San Diego, Calif. $7,210,080. ATLAS/AGENA space boosters. San Diego. Space Systems Div., (AFSC), Los Angeles, Calif.

29—Boeing Co., Wichita, Kan. $1,400,000. Fatigue testing of B-52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Sperry Rand Corp., Phoenix, Ariz. $1,500,062. Aircraft gyroscope compass systems. Phoenix. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Stromberg-Carlson Corp., Rochester, N.Y. $2,003,016. Telephone communications equipment. Rochester. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

30—Goodyear Aerospace Corp., Akron, Ohio. $1,050,263. Aircraft armor. Akron. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

Smithsonian Gets WW II Documents

The Defense Department has transferred about 60,000 captured World War II Japanese and German research documents to the National Air and Space Museum of the Smithsonian Institution in Washington, D.C., where they will become part of the museum's Research Center collection available for study by visiting scholars.

The documents, which have been declassified and microfilmed, are contained in 900 reels of 35mm film. They were transferred from the Defense Documentation Center, Alexandria, Va. The transfer includes the files of pertinent catalog cards.

Navy DSSP Office Relocated

The U. S. Navy's Deep Submergence Systems Project (DSSP) Office has been relocated from the Munitions Building in downtown Washington, D.C., to the Bradley Building, 6900 Wisconsin Ave., N.W., Bethesda-Chevy Chase, Md.

The Public Affairs Office (PAO) will be located in Room 701. Temporary telephone number for the PAO office is (Area Code 301) 657-1912.

The Deep Submergence Systems Project Office has primary responsibility for the major portion of DOD expenditure in the ocean engineering area.

Optical Mark Reader To Be Selected for USAF Headquarters

The Electronic Data Processing Equipment Office of the Air Force Systems Command's Electronic Systems Division (ESD) plans to select an optical mark reader to be installed at the Data Services Center, Headquarters, U.S. Air Force, Washington, D.C.

This equipment will be used to convert questionnaire data for subsequent computer processing. Conversion of 132,000 questionnaires in a 30-day period is now accomplished by a manual key punch method.

Requests for technical information have been sent to the following firms: Control Data Corp., Burlington, Mass.; Delta Associates, Ltd. Inc., New Orleans, La.; Ferranti-Packard Electric, Ltd., Toronto, Ontario, Canada; General Dynamics, Lexington, Mass.; IBM, Cambridge, Mass.; International Development Counselors, New York, N.Y.; Link Group, General Precision Inc., Binghampton, N.Y.; Optical Scanning Corp., Fairless Hills, Pa.; RCA, Washington, D.C.; Raytheon Computer, Santa Ana, Calif.; Recognition Equipment, Inc., Washington, D.C.; and National Computer Systems, Minneapolis, Minn.

ESD's Electronic Data Processing Equipment Office, headed by Col. S. P. Steffes, will evaluate vendor responses. Acquisition of the equipment is expected to be accomplished under existing General Service Administration schedules.

Western Electric Gets $256 Million Contract for Nike-X Research

The Army has awarded a $256,581,512 contract to the Western Electric Co. for continued research development and testing of the Nike-X Missile Defense System.

Western Electric is the prime contractor on the system, however, several thousand firms in nearly every state in the union are expected to share in the contract awards as subcontractors and vendors.

The contract covers design and development work on the Nike-X, testing of system equipment and related work at White Sands Missile Range, N.M., and the Nike-X-operated Kwajalein Test Site in the Marshall Islands.

The cost-plus-incentive fee contract will cover work on the system for the period of Oct. 1, 1966, to Sept. 30, 1967. It does not include funds for production or deployment of the system.

Western Electric Co. will perform work on the system at its plants in Burlington and Greensboro, N.C.

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Missile Mentor Complex Undergoing Tests in Illinois

The Army Air Defense Command (ARADCOM) has begun testing the first of a series of new command posts for improved coordination of surface-to-air missile (SAM) defense of American cities. The tests involve the Missile Mentor system (AN/TSQ-51), a computer-controlled, semi-automatic electronic complex that will harmonize battle actions of missile firing units within a single defense.

The first Missile Mentor has been installed at Arlington Heights, Ill., in the Chicago-Milwaukee defense area. While it is being tested in the next several months before final acceptance by the Army, installation of Missile Mentors in the other selected defense areas will proceed. Missile Mentors will be substituted for all the remaining Missile Master and some of the BIRDIE (Battery Integration and Radar Display Equipment) systems now in use.

Missile Mentor will significantly improve the coverage and effectiveness of Nike Hercules and Hawk missile defense while sharply cutting operating costs and reducing manpower needs. It will increase the reliability, flexibility and effectiveness of coordination—the command and control—of the separate missile batteries in a defended area.

The new system is the first to use a general purpose computer for coordination of Army air defense units. The computer makes it possible for the Missile Mentor to give commanders more complete target data than they have ever had on which to base their battle decisions.

Missile Mentor's modular design makes it possible to enlarge its coverage. Remote Radar Integration Stations (RRIS) can be satellited on the basic system for that purpose. These remote stations are an innovation which makes it possible to "net" additional radars located at great distance from the command post into the overall surveillance coverage. An RRIS can be converted to use as a command post.

Until the tests are completed by ARADCOM, the user of the new system and the U. S. Army component of the North American Air Defense Command (NORAD), regular air defense operations in the various defense areas involved will continue to be managed from the existing command centers. Missile Mentor will provide a vital link between Army Air defense units and other elements of NORAD.

AFLC Tests Early Buying of Repair Parts

The Air Force Logistics Command has initiated a test program to determine feasibility of purchasing certain long-lead-time, partially prefabricated aircraft engine parts prior to their actual requirement. The objective of the program is to provide a more ready response to changes in requirements at minimum cost and to provide earlier response to emergency requirements.

San Antonio Air Material Area, Kelly AFB, Tex., has begun buying a limited number of selected items.

The "buffer stock" concept will normally be used only for items costing less than half the total cost of the finished product and having production lead time for conversion to the finished product of less than half the total lead time.

Present service testing of the concept is limited primarily to castings, forgings and other semi-finished items for jet engines no longer in production.

If the program objectives of better support at equal or less cost can be attained with the limited scope of items initially selected, application of the concept may be expanded.

DEFENSE INDUSTRY BULLETIN

Volume 2 No. 11

November 1966

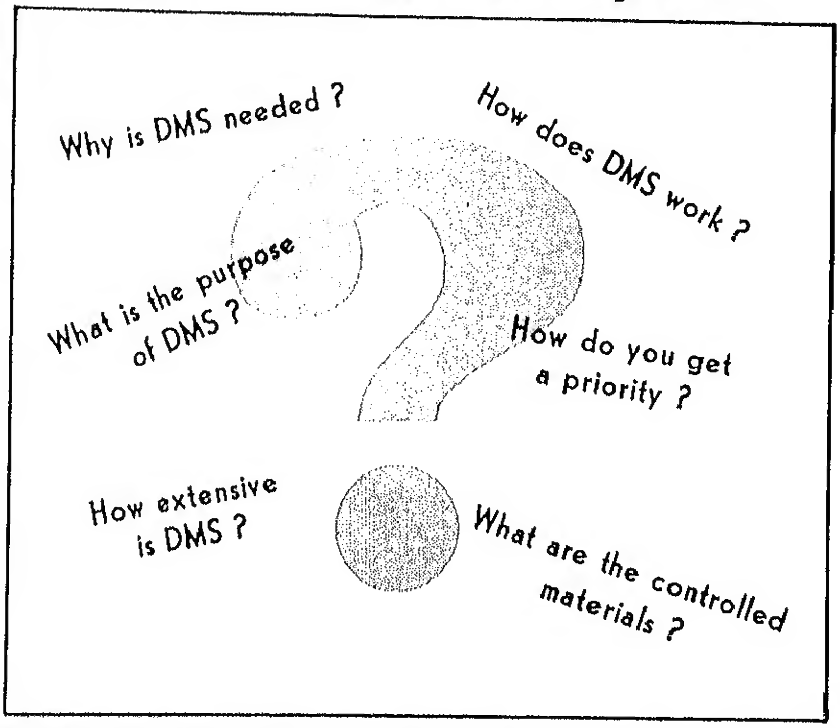
IN THIS ISSUE

DEPARTMENTS

DEPARTMENT OF DEFENSE

ASSISTANT SECRETARY OF DEFENSE-PUBLIC AFFAIRS

The Defense Materials System



In view of the many queries from defense industry on the priorities and allocations procedures of the Defense Materials System (DMS), the Business and Defense Services Administration, U. S. Department of Commerce, which administers the program, was invited to prepare an article for the *Bulletin*. The article which explains the purpose and operation of DMS begins on page 1 of this issue.

A complementary article, describing the use of DMS and priorities by the Defense Department and defense-related agencies, begins on page 8.

Jet-Powered Jeep Tests Device for Curing Dust Damage

Using a jet-propelled Army jeep, the Air Force's Office of Aerospace Research (OAR) is testing a new device in Arizona which hopefully will provide protection against the ill effects of dust on helicopters, trucks and other machinery in Vietnam where the situation is becoming a major problem.

The device, a clustered particle separator, was mounted on the air intake of the modified M-151 jeep during tests by scientists at the Aerospace Research Laboratories (ARL), Wright-Patterson AFB, Ohio.

After a series of preliminary experiments at Wright-Patterson, the jeep was flown to Arizona where it was subjected to dry desert dust tests.

The separator was devised by Dr. Hans J. P. von Ohain, chief scientist and senior research leader in the ARL energetics laboratory. Designed to prevent erosion of the compressor section in the engine and glass formation on the engine's hot surfaces, the separator removes dust particles and other foreign objects from the air before they can be sucked into the engine.

Estimates show that maintenance, including replacement of bearings and complete engines, on various jet aircraft engines afflicted by dust ingestion in Vietnam last year cost $100 million.

The Air Force hopes that the dust problem will be solved with the development of the separator, which should restore the life span of aircraft engines to a level comparable to that of engines operating under normal conditions.

New Helicopter Radar System Developed and Flight Tested

A unique and potentially revolutionary helicopter radar system has been developed and flight tested to increase the capability of a helicopter to fly at night and in foggy weather.

The development was accomplished under the long-range Joint Army-Navy Instrumentation Research (JANAIR) Program, under way for several years, which has the objective of improving and simplifying cockpit instrumentation display systems in fixed-wing aircraft and helicopters. The radar program is administered by the Office of Naval Research.

The system, which was developed by Bell Helicopter, Co., Fort Worth, Tex., with special radar equipment provided by Texas Instruments, Inc., Dallas, Tex., does not require a computer, mechanical components, or a servo system for its operation. This increases the system's reliability and maintainability and gives it the ruggedness to survive in a combat environment. The receiver and sweep generator are all-transistorized units.

Flight tests have demonstrated that contrast between objects and differing terrains is such that almost pictorial ground mapping results. Large or extended objects, such as airport runways or highways, are unmistakable and pilots, aided by photos, charts, or previous knowledge, can readily identify clusters of trees, buildings, or oil tanks. The display tube, which is a direct-view storage tube, also can provide a high resolution television picture if a television input is provided.

DEFENSE INDUSTR

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The purpose of the *Bulletin* to serve as a means of communicatio between the Department of Defen (DOD) and its authorized agenci and defense contractors and oth business interests. It will serve a guide to industry concerning of cial policies, programs and project and will seek to stimulate thought members of the defense-industry tea in solving the problems that may ari in fulfilling the requirements of t DOD.

Material in the *Bulletin* is s lected to supply pertinent unclassifi data of interest to the business co munity. Suggestions from indust representatives for topics to be co ered in future issues should be fo warded to the Business & Lab Division.

The *Bulletin* is distributed witho charge each month to representativ of industry and to agencies of the D partment of Defense, Army, Navy a Air Force. Requests for copies shou be addressed to the Business & Lab Division, OASD(PA), Room 2E81 The Pentagon, Washington, D. 20301, telephone, OXford 5-2709.

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The Defense Materials System and Priorities

By
Anthony A. Bertsch

In this year of 1966 the issue of war and peace still looms as a most important factor in the shaping of our national policies and administrative efforts. The world situation today demands many unprecedented efforts to insure our national security.

The size and composition of our defense program dramatically symbolize such endeavors. Our involvement in Southeast Asia, the system of world-wide bases, the deployment of American forces in other parts of the world, foreign military aid, are a few other examples familiar to all Americans. There are other measures employed by the Government to protect our national security, however, which make important contributions to this goal but which are much less familiar to the general public. One of these is the operation of the Defense Materials System in our economy.

Why the Defense Materials System is needed.

The Defense Materials System (DMS) is a body of Government regulations, orders and procedures, issued under the authority of the Defense Production Act, designed to accomplish two main purposes. First, DMS is a means of directing the flow of materials and products to the nation's military, atomic energy and space production, construction and research and development programs. These programs are referred to as "defense programs." DMS helps insure that defense programs are maintained on schedule by providing a priority for the purchase of materials by contractors, subcontractors and their suppliers. Second, the operation of the system results in the maintenance of an administrative means of promptly mobilizing the total economic resources of the country in the event of war.

The priorities provided under DMS are required to insure a timely flow of materials and components to the defense programs, atomic energy developments, and programs for missile systems and space. In addition, the supplies and equipment needed to assure the combat effectiveness of our military forces in South Vietnam are obviously important to our national security. Other less obvious programs are also important to assure the security of our nation.

Considering the enormous sums appropriated for these purposes and recognizing the tremendous importance of these programs in the light of the continuing world situation, the operation of DMS represents a very small premium which we are paying for a substantial insurance coverage. Even in times of generally ample supply, certain materials and components are relatively scarce for a variety of reasons. In some cases unusual specifications create supply difficulties, both with respect to materials and the industrial facilities needed to process them. The situation with regard to ample supply of many materials or products may change overnight as a result of special situations such as strikes or international incidents. Fluctuations in the general economic situation may also affect the availability of materials needed for defense programs. The operation of DMS minimizes the effects of these various industrial and economic factors on defense programs.

Anthony A. Bertsch is Asst. Administrator, Industrial Mobilization, of the Business and Defense Services Administration, U. S. Department of Commerce. He has held positions related to industrial mobilization in the Commerce Department since 1954 and prior to that served with the National Production Authority.

A strong and ready industry is as much a part of our national defense as a competent military organization. Industry's contribution to our national security, both under present conditions of the cold war or a possible enlarged war situation, cannot be determined by the military alone or by any particular civilian branch of our Government. The atomic age, and now the space age, have developed a partnership between Government and industry under which cooperative efforts will assure the strength of our nation to meet any threat to our nation's security.

Authority.

Under Title I of the Defense Production Act of 1950, as amended, the President is authorized to establish priorities in the performance of contracts or orders necessary to promote the national defense and to require the acceptance and performance of such contracts or orders for the purpose of assuring such priorities. He is also authorized, under the same title, to allocate materials and facilities for the purpose of promoting the national defense. The term "national defense" is defined in the Defense Production Act as ". . . programs for military and atomic energy production or construction, military assistance to any foreign nation, stockpiling, and directly related activity."

These priority and allocation powers are administered by the Business and Defense Services Administration of the Department of Commerce under delegation from the Secretary of Commerce, to whom they have been delegated by the President through the Director of the Office of Emergency Planning (OEP). This delegation relates to the broad field of industrial production and materials, as well as construction and research and development. Certain other Government agencies such as the Department of Agriculture, Department of Interior and Interstate Commerce Commission have been delegated priority and allocation powers with respect to certain products, materials and services coming under their jurisdiction. The administration of these powers with respect to industrial production and most materials is accomplished through a

series of regulations and orders designated as the Defense Materials System.

In delegating these authorities to the Secretary of Commerce, OEP has retained general policy guidance and coordination of the exercise of these powers by the Department of Commerce and the other delegate agencies. OEP has also retained the general program function.

An important feature of DMS is the fact that the use of priorities for defense programs is mandatory and not optional. This assures full support to defense programs and provides the Government with a source of essential statistical information regarding the impact of the defense programs on the economy as a whole.

Historical background.

The experience of World War II and the Korean Conflict has shown that converting industry from peacetime to wartime objectives has beeen and can be a time-consuming task. From the entrance of the United States into World War II after the attack on Pearl Harbor it took well over a year to develop a fully effective system of industrial controls to support the war effort. After a period of trial and error in the use of priorities and allocations, the War Production Board developed a system, the Controlled Materials Plan (CMP), which became effective early in 1943. Once under way CMP was instrumental in providing the sinews required to conduct the most extensive military operation in our history.

The principles of CMP were essentially simple. Its purpose was to balance the supply of industrial resources with the requirements of the nation to prosecute the war to a successful conclusion. It was determined after careful analysis that three basic materials, steel, copper and aluminum, constituted a common denominator on the basis of which most of the industrial requirements for both military needs and the needs of the civilian economy could be measured. These three materials were designated the "controlled materials." The total supply of controlled materials was determined quarterly and the military and civilian requirements, established by the responsible Government agencies, were collected and measured in terms of the controlled materials needed to accomplish them. A balance was established between the available supply and the total requirements by adjusting the requirements on a time-phased basis and on the basis of essentiality.

This process of assessment and balance was conducted by the Requirements Committee of the War Production Board. The operations of this supply-requirements analysis procedure resulted in a series of balanced programs for military and civilian needs. The Requirements Committee issued allotments of controlled materials to each of the Government agencies involved which were designated "claimant agencies." The claimant agencies then allotted appropriate quantities of controlled materials to and authorized the use of priority ratings by contractors and suppliers. In this way individual producers of needed products, equipment and materials were assured of a designated supply of the three controlled materials and were authorized to use priorities to obtain the necessary supporting components and materials to complete their schedules.

Despite the experience gained in World War II, when the United States entered the Korean Conflict in the summer of 1950, it again took a year for the National Production Authority (NPA) to install and make effective a modified version of CMP to direct the flow of products and materials into programs essential to the successful consummation of that effort. This was accomplished under authority provided in the Defense Production Act of 1950.

When the Korean War ended by mid-1953 there was finally an awareness of the need for improving our preparedness position for industrial mobilization to meet any future emergency. The renewal of the Defense Production Act in 1953 reflected the concern of both Congress and the Executive Branch of the Government with achieving a continuing state of readiness for effective mobilization, resulting from the unsettled world situation. Of equal importance was the recognition by industry leaders that industry itself had a vital stake in the maintenance of a system in being to meet the continued heavy defense requirements and as a readiness measure which could be promptly expanded to meet the needs of an emergency situation. There was general agreement among responsible Government and industry representatives that only by the continued operation of a set of Government rules designed to accomplish this purpose could we achieve the industrial goals necessary to our national security and be ready for the accelerated and changed industrial activity which might be required in the event of another national emergency. On the basis of this consensus DMS was established shortly before the end of the Korean War.

DMS is a greatly simplified version of the Controlled Materials Plan which was in effect during the Korean War and is limited in its operation to defense programs. It has been in continuous operation since July 1, 1953, but has been greatly simplified since its inception.

The priorities system helps the defense contractor or subcontractor to obtain the materials and products needed to fill defense orders on time. DMS regulations, orders and procedures are designed to assure the contractor preferential treatment to meet his defense commitments. Bear in mind that our present stepped up military requirements for defense, at home and abroad, come at a time when our economy is operating close to its overall capacity. Under these conditions, the priority system should enable us to meet our military requirements without the imposition of civilian controls. Also bear in mind that our Government must be in a position to see that the materials and equipment needed to support our defense effort are supplied on time and in the right amounts.

The purpose of this article is to give readers of the *Defense Industry Bulletin* a better understanding of:

- The purpose of DMS.
- Its method of operation and its procedures.
- Industry responsibilities, obligations and benefits under DMS whether a defense prime contractor, a subcontractor, or a supplier.

What is DMS and what are its purposes?

As previously stated, DMS is a series of Government regulations, orders and procedures issued under the authority of the Defense Production Act. It is designed to accomplish two main purposes:

- It is a means of directing the flow of materials and products to the production, construction and research

and development requirements of the nation's defense programs. DMS helps to insure that these defense programs are maintained on schedule by providing a priority for the purchase of materials by defense contractors, subcontractors and their suppliers.

• The operation of DMS permits the maintenance of an administrative means of promptly mobilizing the industrial resources of the country in a limited or general war.

DMS is not a standby system of priorities. It is in operation right now and has been operative since 1953 and, because of it, this nation is better equipped to meet its military commitments in South Vietnam than it was in previous conflicts.

How extensive is DMS?

DMS is limited in its application to the programs of the Defense Department, the Atomic Energy Commission, the National Aeronautics and Space Administration, and certain "associated agencies" of DOD responsible for specific defense-related programs. There are only 34 defense and defense-related programs to which the DMS rules apply. A list of these programs is shown in Figure 1. DMS rules do not apply to civilian production nor do they apply to procurement of Government agencies other than those with assigned defense responsibilities.

Defense Programs Covered by the Defense Materials System

Program identification	Program	Defense agency
	For Department of Defense and associated programs	
A-1	Aircraft	Dept. of Defense: Army. Navy (including Coast Guard). Air Force.
A-2	Missiles	
A-3	Ships	
A-4	Tank—Automotive	
A-5	Weapons	
A-6	Ammunition	
A-7	Electronic and Communications Equipment	
B-1	Military Building Supplies	
B-8	Production Equipment (for defense contractor's account)	Associated Agencies of Dept. of Defense: CIA.* FAA.* NASA.*
B-9	Production Equipment (Government-owned)	
C-2	Department of Defense Construction	
C-3	Maintenance, Repair and Operating Supplies (MRO) for Department of Defense Facilities	
C-8	Controlled Materials for Naval Stock Account	
C-9	Miscellaneous	
	For Atomic Energy Commission programs	
E-1	Construction	AEC.*
E-2	Operations—including Maintenance, Repair and Operating Supplies (MRO)	
E-3	Privately Owned Facilities	
	For other Defense, Atomic Energy and related programs	
B-5	Certain self-authorizing consumers (see sec. 9(d) of DMS Reg. 1)	BDSA.*
C-4	Certain munitions items purchased by friendly foreign governments through domestic commercial channels for export	
C-5	Canadian Military Programs	
C-6	Certain direct defense needs of friendly foreign governments other than Canada	
D-1	Controlled Materials Producers	
D-2[1]	Approved state and local civil defense programs	
D-3	Further Converters (Steel)	
D-4	Private domestic production	
D-5	Private domestic construction	
D-6	Canadian production and construction	
D-7	Friendly foreign nations (other than Canada) production and construction	
D-8	Distributors of controlled materials	
D-9	Maintenance, Repair and Operating Supplies (MRO) (see Dir. 1 to DMS Reg. 1)	
E-4	Canadian Atomic Energy Program	
K-1	General Services Administration's Stores Depot Program	
AM	Aluminum Controlled Materials Producers	
AM-9000	Aluminum Controlled Materials Distributors	
FC	Further Converters (steel and nickel alloys)	

* Abbreviations as follows:
AEC—Atomic Energy Commission.
BDSA—Business and Defense Services Administration.
CIA—Central Intelligence Agency.
FAA—Federal Aviation Agency.
NASA—National Aeronautics and Space Administration.

[1] State and local governments will be authorized to use the program identification symbol D-2 only upon application to the Office of Civil Defense of the Department of Defense, sponsorship by the Office of Assistant Secretary of Defense (Installations and Logistics) and specific approval by BDSA.

Figure 1.

How does DMS work?

It works by the use of priorities and the allocation of certain controlled materials for defense and related programs. First, let us examine priorities and later we will consider the controlled materials.

How does one get a priority?

There are only two ways in which a priority can be obtained. One is from a Government agency, the other is from the customer. It should be emphasized that it is mandatory that all contracts or purchase orders for defense programs be identified by a priority. This applies equally to the Government agency that places the order or awards the contract, the defense contractor who places an order with a supplier or subcontractor, and the supplier or subcontractor as well.

For example, when the Air Force places a contract for aircraft it will use the priority DO–A–1. Similarly an Atomic Energy Commission construction contract would have the priority DO–E–1. And a subcontractor for the aircraft manufacturer would get an order with the same DO–A–1 priority.

There are two kinds of priorities: One is a rated order, which will be discussed at this point, and the other is an authorized controlled material (ACM) order, which will be described later. ACM orders are used to get controlled materials—steel, copper, aluminum and nickel alloys. Rated orders are used to get other materials and products. A rated order must contain these four elements:

• The priority rating—which consists of the prefix DO or DX, followed by the appropriate program identification, such as A–1, E–1, etc.

• Either of the following certifications: "Certified for national defense use under DMS Regulation 1" or "Certified under BDSA Regulation

2." Either of these certifications is acceptable on a rated order.

• The signature of an authorzied official of the firm placing the rated order.

• The delivery date or dates required.

The purchaser or Government agency must also furnish the supplier with a statement reading substantially as follows:

"You are required to follow the provisions of DMS Regulation 1 and of all other applicable regulations and orders of BDSA in obtaining controlled materials and other products and materials needed to fill this order."

This statement must appear on the order or on a separate piece of paper attached to the order.

Figure 2 shows a sample DO-rated order. When a rating is used on the purchase order, it must contain the four elements just mentioned and which are circled in the illustration.

The certification on purchase orders must be signed by the person placing the order or by a responsible individual who is duly authorized to sign for that purpose.

DMS is a complete system because the rating authority that originates with the Government defense agency is passed down and used throughout the entire chain of supply to fill the original rated contract or purchase order. The mandatory use of ratings protects the priority status of the procurement cycle and it also applies to replacements in inventory of products and materials used to fill rated orders. The only exception to the mandatory use of ratings is an optional exception for individual purchase orders of $500 or less.

What is the preferential status of a rated order?

There are two types of priority ratings: DO ratings and DX ratings. The letters DO and DX are the rating symbols. A complete priority rating consists of one of these rating symbols plus the appropriate program identification, for example, DO–A–1 or DX–A–2. The program identification does not affect the preferential status of the rating. All DO ratings have equal preferential value. A DO–A–1 has the same status as a DO–C–2. DO-rated orders take precedence over unrated orders. All DX ratings have equal preferential value but DX-rated orders take precedence over DO-rated orders and unrated orders. It is emphasized that a DX rating is really a super-priority, which is used to a very limited extent. It is used primarily for specially designated defense programs of the highest priority.

What rules apply to the acceptance of rated orders?

Every rated order must be accepted and filled regardless of existing contracts and orders, except under the following circumstances:

• If the prospective purchaser is unwilling or unable to meet the vendor's regularly established prices or terms of sale or payment.

• If the rated order is for a product or a service which the supplier does not usually make or perform.

• If the rated order is for a product or material which the supplier makes or acquires for his own use.

• If filling the rated order would stop or interrupt the supplier's operations during the next 60 days in a way which would cause a substantial loss of total production or a substantial delay in operations.

• If the rated order is placed by a person who produces the same product or performs the same service as that ordered.

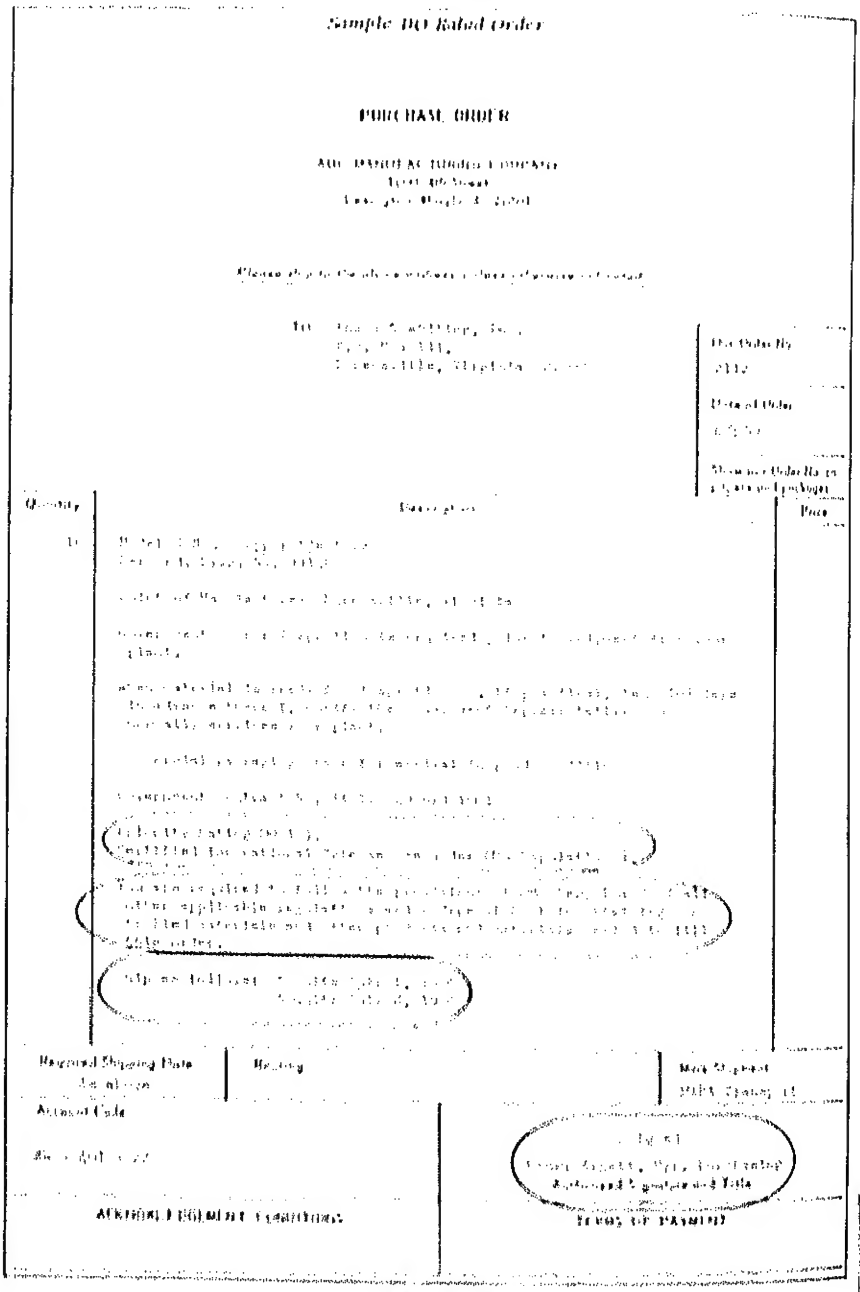


Figure 2.

• If the rated order would interfere with delivery of any rated order which has already been accepted. However, a DX-rated order must be accepted without regard to the effect of such acceptance upon the filling of unrated or DO-rated orders.

In general, rated orders must be filled by the required delivery date. If a contractor does not expect to be able to fill a rated order by the time requested, he must not accept it for delivery at that time. He must either reject the order, stating when he could fill it, or accept it for delivery on the earliest date he expects to be able to deliver, informing the customer of that date.

How is a rating used?

If a contractor receives a rated contract or order, he must use the rating to purchase the products and materials he needs to fill the order or to replace inventory used to fill the order.

If a contractor accepts a rated order and finds it necessary to delay delivery on an unrated order, he is protected from any legal action his customer may take because of such delay. This is a very important protection provided by the Defense Production Act and BDSA Regulation 2.

Up to this point, the general purpose of DMS has been discussed, the defense programs to which it applies, the technical nature of a priority and how it is obtained and used; but DMS as a complete system has not really been covered.

Earlier it was indicated that the basic principles, rules and procedures are embodied in a series of regulations and orders. (A listing of these regulations, orders and related actions may be found on page 38 of this issue. These documents can be obtained from any Department of Commerce Field Office. A listing of the field offices may be found on page 40.) The two primary regulations in the system are DMS Regulation 1 and BDSA Regulation 2. BDSA Regulation 2 sets forth the basic rules of the priorities system and DMS Regulation 1 sets forth the basic rules of the Defense Materials System.

DMS Regulation 1 applies to production, construction and research and development for defense programs involving the use of controlled materials—steel, copper, aluminum and nickel alloys, whereas BDSA Regulation 2 contains the rules and procedures which apply to the procurement of other products and materials. In addition, there are seven M-orders relating to production, delivery and distribution of certain materials and products.

What are the controlled materials?

There are four controlled materials—steel, copper, aluminum and nickel alloys—which are divided into eight categories as follows:

• Carbon Steel (including wrought iron).

• Alloy steel (except stainless steel).

• Stainless steel.

• Copper and copper-base alloy brass mill products.

• Copper wire mill products.

• Copper and copper-base alloy foundry products.

• Aluminum.

• Nickel alloys.

Each of these eight categories is further broken down into the various forms and shapes of the four basic materials, e.g., sheet, strip, rods, bars, wire, etc. These are listed in Schedule 1 of DMS Regulation 1.

The eight categories are used for the purpose of making allotments which will be covered later.

Defense agencies contract for or buy directly a wide variety of items. These cover virtually every aspect of our industrial economy including construction, research and development, military hard goods, common use items, and a wide variety of soft goods, including chemicals and medicinals. We have tried to organize this great variety of items into a limited number of categories which would be manageable under our priorities system.

With this in mind, we have established a category of items containing controlled materials made to military specifications which we call Class A products. As a matter of convenience, both construction and research and development are classified as Class A products. These include not only such obvious military items as ships, tanks, and guns, but also the specialized components going into these major products.

A second category we have established is called Class B products which are, in general, common-use items containing controlled materials and which are normally made by manufacturers for off-the-shelf sale. Such items as fractional horsepower motors, machine tools, nuts and bolts, and a vast variety of other items are included in this general category.

The third broad category carries no classification at all since it includes all the other items which generally do not contain controlled materials such as uniforms, fabrics, bedding, medicines, chemicals and many other things.

When a defense agency places a contract for a Class A product, the contract or purchase order carries a priority rating. If the contract is for defense production or research and development, the prime contractor is required to submit an application, on Form DMS-4A, to the agency from which he received the contract specifying the quantities of controlled materials he needs to fill the contract. If it is a construction contract, the contractor has to submit an application on Form DMS-4C. The defense agency involved, which we call an allotting agency, then issues an allotment of the requested amounts of controlled materials to the contractor with an authorization to use the appropriate rating and program identification. The priority rating consists of the rating symbol, DO or DX, and a program identification, for example A-1, which means aircraft. The contractor is now required to use the symbol A-1 to place priority orders for controlled materials, and the priority rating DO-A-1 to get other materials and products needed to fill the contract.

If the prime contractor needs to buy Class A products which are specially designed components, he merely places a rated order with his supplier but does not give his supplier an allotment of controlled materials. The only ones who ever receive an allotment of controlled materials are prime contractors for the production of Class A products. If a contractor receives a prime contract for the production of Class B products, he does not get an allotment of controlled materials from the defense agency. He merely gets a rating with his contract.

Anyone, whether he is a prime contractor or a subcontractor, who has received a rated order without an allotment is nevertheless authorized to use a priority to obtain controlled materials. We call this priority an Authorized Controlled Material order or, more commonly, an ACM order.

This can be stated in a slightly dif-

ferent but summarized form. A contractor who receives a prime contract from a defense agency for Class A products gets an allotment and an authorization to use a priority. In DMS Regulation 1, these contractors are called prime consumers. Contractors, who receive prime contracts for Class B products, and sub-contractors, who receive rated orders for Class A products or Class B products, do not receive an allotment from anyone but they do receive a rating. These contractors or suppliers are called self-authorizing consumers in contrast to those who are called prime consumers. The reason we use the term self-authorizing consumer is because they do not have to submit an application to get an allotment and authorization but instead use the provision in the regulation which authorizes them to place ACM orders to get controlled materials.

In making application for an allotment, the prime consumer must include the total quantity of controlled materials required to fill the contract. This includes the quantities of controlled materials for his own use as well as those required by his suppliers from whom he purchases Class A products that are to be incorporated in his product.

If a prime contractor needs information regarding the controlled-material requirements of any of his suppliers of Class A products, he may request them to submit this information on Form DMS-6. A facsimile of the form is contained in Schedule V of DMS Regulation 1. This form is not supplied by the Government; however, the prime contractor may duplicate this form. The use of the form is not limited to prime contractors but may, in turn, be used by his suppliers of Class A products to obtain the necessary information from their suppliers of Class A products.

What is an ACM order?

An ACM (Authorized Controlled Material) order means any purchase order for any controlled material (as distinct from a product containing controlled material) which is placed pursuant to an allotment of controlled material or pursuant to self-authorization.

How is an ACM order placed?

Figure 3 shows a sample ACM order. All ACM orders must contain the four elements that are circled in the illustration in addition to the basic data on the purchase order. These elements are:

- The required delivery date.
- Statement on applicability of BDSA regulations and orders
- The allotment number and certification.
- Authorized signature of a responsible official.

A word about the allotment number. You will observe that it consists of the program symbol, e.g., A-1, plus the calendar quarter for which the allotment is valid. In the case of an ACM order of a self-authorizing consumer, the calendar quarter identification is the delivery date requested. This should not pose any problem because the basic form of the allotment number is the same for a prime consumer or a self-authorizing consumer. If the contract or purchase order is a DX-rated order, the DX designation must be added as a suffix to the allotment number, e.g., A-4, 3Q66-DX and the order thus becomes an ACM-DX order. An ACM-DX order is entitled to priority in acceptance or delivery over other ACM orders.

What are the general rules regarding placement of ACM orders?

- All defense contractors, either prime consumers or self-authorizing consumers, must place ACM orders to obtain the controlled materials needed to fill a rated contract or order.

Sample ACM Order

STRUCTURES, INC.

1000 Longview Avenue
Tennyson, Illinois 62370

DATE February 1, 1966
PURCHASE ORDER NO. 9212
SHIP VIA Motor Freight

TO: Ajax Metals, Inc.
400 Water Street,
Cranston, New Jersey 08210

SHIP TO: Structures, Inc.
As above.

CONTRACT NO. DA-98-031-ENG-9623
SPECIFICATION To Federal Specification QQS-741A, Type 1, Class 1.

REQUIRED DELIVERY DATE:
April 1, 1966

Item	Number Pieces	Shape	Size	Length	Total Weight	Notations
1	3	Beam	24" - 120#	27' - 10½"	10,035#	
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Above contract carries rating DO-A-2.

You are required to follow the provisions of DMS Reg. 1 and of all other applicable regulations and orders of BDSA in obtaining controlled materials and other products and materials needed to fill this order.

Allotment Number A-2-3Q66. Certified for national defense use under DMS Regulation 1.

(Signed)
John Smith
Manager of Purchasing
Authorized signature

Figure 3.

• ACM orders must not call for delivery of any controlled materials in an amount greater than required to fill rated orders. The exception is where such quantities would be less than the minimum mill quantities listed in Schedule IV of DMS Regulation 1, and are not procurable from a distributor. In such cases, an ACM order may be placed for the full minimum shown on that schedule and the delivery of that quantity may be accepted by the supplier.

• The mandatory use of ACM orders need not be followed if the individual purchase order is in an amount of $500 or less.

• The mandatory use of ACM orders applies not only to the procurement of controlled materials to fill defense-rated orders, but also to the replacement in inventory of such materials used to fill such orders.

What are the general rules regarding acceptance of ACM orders?

Producers of controlled materials are required to accept all ACM orders except under the following circumstances:

• If the order is received after commencement of lead time as listed in Schedule III of DMS Regulation 1.

• If the order is for less than the minimum mill quantity shown in Schedule IV of DMS Regulation 1.

• If the prospective purchaser is unwilling or unable to meet the supplier's regularly established prices and terms of sale and payment.

• If the order need not be accepted under any of the individual controlled material M-orders.

• In the case of ACM-DX orders, the producer must accept them without regard to lead time or set-asides unless it is impracticable to make delivery within the required delivery month, in which case he must accept the ACM-DX order for the earliest practicable delivery date and so notify his customer.

Controlled materials distributors must accept all ACM orders except under the following conditions:

• If the order is not for immediate delivery.

• If he does not have the material in stock, unless it is ordered and he knows that it is in transit to him.

• If the prospective customer is unwilling to meet the distributor's regularly established prices and terms of sale or payment.

• If the order need not be accepted under any of the individual controlled material M-orders.

Up to this point, some of the essential elements of the Defense Materials System and priorities as embodied in DMS Regulation 1 and BDSA Regulation 2 have been discussed. In addition to these regulations, certain rules are applicable to particular controlled materials and particular products. These rules are contained in BDSA M-orders (see listing on page 38).

The fact cannot be emphasized too strongly that contractors must become familiar with the regulations and orders; this article is not meant to substitute for the actual regulations and orders.

Some of these M-orders contain set-aside provisions whereby producers of controlled materials and certain products are required to reserve a portion of their production to fill rated orders. This is done to assure that an adequate supply of these materials will be available to fill priority orders.

There are several other items that should be mentioned. If a contractor accepts a rated order he must use the rating to obtain containers and packaging material needed to make delivery, and it must be used to obtain chemicals needed in the production of the item.

A rated order or an ACM order may not be used to obtain capital equipment or for the purpose of plant expansion or improvements. If inability to obtain capital equipment would result in the failure to fill a rated order that has been accepted, an application for a rating for such capital equipment should be made to the responsible allotting agency.

Maintenance, repair and operating supplies (MRO) may be obtained in accordance with the provisions of DMS Regulation 1, Direction 1. This directive provides for the use of a DO-D-9 rating for MRO and for the allotment number D-9 on ACM orders for controlled materials needed for MRO, but only if inability to obtain MRO would prevent a contractor from filling a rated order.

There is one problem which many contractors have already encountered, i.e., what does a contractor do if he is having difficulty in getting what he needs after a rated order has been placed? We all know that there are situations in which there are delivery delays or bottlenecks even though an order has been rated. For example, there can be conflicting rated orders on the supplier's schedule, there might be inadequate facilities to produce the particular item, and others. BDSA has set up a procedure to provide special assistance for defense contractors and suppliers when the regular DMS and priority procedures are ineffective.

In such circumstances, the defense contractor may submit a request for special assistance on Form BDSAF-138 to the procuring or allotting agency involved. If the agency is unable to overcome the difficulty, the request is forwarded to BDSA for action.

We will attempt to expedite the deliveries or correct the bottleneck situation by negotiating with the supplier, locating other sources, or by other means. We might use one of several methods such as:

• Arrangement of improved delivery dates by informal agreement with the supplier.

• Issuance of a directive requiring the supplier to produce or deliver the specific item by a specified date.

This is always done in cooperation with the supplier and the defense agency involved.

A directive issued by BDSA takes precedence over all preferential orders, depending upon the terms of the directive. An example of directive action would be the rescheduling of the production and deliveries of a particular supplier to meet the needs of the defense agency involved.

Copies of Form BDSAF-138 may be obtained from the office administering the contract or from any Department of Commerce Field Office.

It should be emphasized that BDSA will not and cannot undertake to provide such assistance unless and until the contractor has exhausted every means at his disposal.

If a contractor is engaged in defense work he must be familiar with DMS rules and procedures. This is a responsibility of all defense contractors which is absolutely essential if they are to make their maximum contribution to our national security. We have designed the DMS and priorities system to aid both the contractor and the Government.

(Editor's Note: See list of BDSA regulations beginning on page 38; list of U. S. Department of Commerce Field Offices on page 40.)

The Use of DMS and Priorities by the DOD and Defense-Related Agencies

By
S. M. Mateleki, Jr.

Under the rules and regulations by the Defense Materials System (DMS) the Business and Defense Services Administration (BDSA) has delegated to the Secretary of Defense and the Chairman of the Atomic Energy Commission three main priorities and allocations authorities, namely, to rate their contracts and orders with DX or DO; to assign the right to apply the DX or DO ratings for capital equipment; and to allocate steel, copper, aluminum and nickel alloys for their Class A products. The Secretary of Defense has delegated these powers to the Assistant Secretary of Defense (Installations and Logistics). These powers, in turn, have been delegated by the Assistant Secretary of Defense (Installations and Logistics) to the Army, Navy, Air Force, Defense Supply Agency, Defense Communications Agency and the Defense Atomic Support Agency.

Certain other agencies, for programs approved by the Office of Emergency Planning, operate under letter delegations from the Assistant Secretary of Defense (Installations and Logistics). These approved programs and their administering agencies are:

- Space programs by the National Aeronautics and Space Administration.
- Civil Air Carrier Program; Airline Maintenance, Repair and Operating Supplies Program; and the Air Navigational Aids Program by the Federal Aviation Agency.
- Selected Intelligence Programs by the Central Intelligence Agency.
- Stores Depot Program by the General Services Administration.

Written delegations authorizing the use of these priorities powers are made to the contracting officers in the Military Departments, Defense Supply Agency and the other agencies mentioned above.

At this point in time and since 1950, it has been and is mandatory that the procurement contracting officers rate all their contracts and orders with a few minor limitations imposed on DOD by BDSA. Examples of these limitations for which ratings cannot be used are:

- Civilian-type items procured for resale in post or base exchanges.
- Food or petroleum products except their packaging containers and chemicals used or needed to process such products.
- Services per se.
- Construction equipment procured for use in the United States.
- Army Civil Works Program.

Contracts and orders under $500 do not have to be rated under BDSA regulations; however, DOD practice is to rate these small orders and contractors are urged to do likewise for their protection.

DOD procurement contracting officers have to know those contracts and orders which must be rated DX and those which must be rated DO. To clarify this, it will be necessary to discuss the DOD Master Urgency List.

DOD maintains a classified DOD Master Urgency List, for use within Government only, which contains programs of highest national urgency (first category); programs of highest DOD urgency (second category); and other important DOD and Canadian military programs (third category). This list is used for three main purposes within the Government as follows:

- To inform the procurement contracting officers of those contract and orders which must be rated DX
- As internal guidance for utiliz tion of in-house resources on a first things-first basis.
- To resolve conflicts for produc tion resources in the Special Assist ance Program which will be discusse in more detail later.

Stanley M. Mateleki Jr. is Special Asst. for Priorities and Allocations in the Office of the Asst. Secretary of Defense (Installations & Logistics). He has served in positions related to the priorities and allocations field within OASD(I&L) since 1954, and has had 25 years experience in Government procurement and production.

Under the written delegations t the procurement contracting officer they must rate contracts and order in support of the highest nationa category programs listed in the firs category of the Master Urgency Lis with the DX rating. These program are approved by the President of th United States, are very few in num ber, are limited in dollar volume, an are deemed of such importance tha every authority we have is used t prevent them from getting int trouble or from being delayed. Thi does not mean that all requirement to fill an entire program are ordere for delivery at once. DOD instruction stress the early placement of order and the establishment of realisti phased contract schedules by the pro gramming offices to enable timely de liveries to meet the compressed opera tional dates usually inherent in thes top urgent programs.

At present the DX programs are 1 in number and are known as "Brick Bat .01" programs. Ten are admini tered by DOD, two are administere by the National Aeronautics an Space Administration and one by t Federal Aviation Agency. The tot annual dollar volume of all 13 pr grams is less than 25 percent of tot ratable procurement, which is the lim placed on these programs to keep t DX program rating meaningful. T second category, known as "Brick-B Other Than .01," contains 39 highe DOD urgency programs, and t third category, "Cue-Cap," contai 20 DOD and Canadian military pr grams of lesser importance. This l is revised on a continuing basis to r flect current conditions. DOD instru tions prohibit the use of the Bric

Bat .01, Brick-Bat Other Than .01 and Cue-Cap urgency category designation on industrial paper since this is an internal system for the three internal governmental uses described above.

As stated earlier, the procurement contracting officers must rate contracts and orders in support of "Brick-Bat .01" programs with the DX rating. Almost all other DOD procurement is rated DO by the procurement contracting officers. Again, our instructions stress the early placement of these contracts and orders with realistic, phased contract schedules.

The DX and DO ratings are fully extendible throughout the industrial chain. It is mandatory that contractors and suppliers extend these ratings for materials, components and subassemblies to be physically incorporated in the contract items, with one exception. The exception is that DX and DO ratings are not extendible for the various forms and shapes of the controlled materials—steel, copper, aluminum and nickel alloys—since authorized controlled materials orders (ACMO's) must be placed for these materials under DMS regulations.

Let us assume that all rated contracts and orders have been placed and accepted, and a contractor is in a position where he has all materials and components for timely manufacture and delivery of the contract item except the controlled materials.

The question now is, how does a contractor assure timely deliveries of the forms and shapes of the controlled materials needed for his contract?

This is accomplished through the Defense Materials System which is essentially a bank and check system. Based on phased quarterly program controlled materials needs (submitted to DOD by the prime contractors on DMS-4A applications for production and research and development contracts, and on DMS-4C applications for construction contracts) and on any new program needs known to DOD, quarterly phased controlled materials requirements are submitted to the Office of Emergency Planning and, in turn, to BDSA, Washington, D. C. BDSA, having DOD controlled materials requirements, Atomic Energy Commission (AEC) controlled materials requirements, and the Class B product controlled materials requirements, establishes a set-aside—which can be considered as a bank—for each controlled material producer, sufficient to cover all rated orders.

Meanwhile, the Office of Emergency Planning makes a bulk allocation to DOD and AEC. The Office of the Assistant Secretary of Defense (Installations and Logistics)—OASD(I&L)—reallocates to the Military Departments, Defense Supply Agency, National Aeronautics and Space Administration and the Federal Aviation Agency sufficient controlled materials for their needs. These allocations, in turn, are passed to the allotting offices who make allotments to the prime contractors on DMS Forms 10, if production, or DMS Form 13, if construction, based on their DMS-4A and DMS-4C applications, respectively.

Using these allotments, prime contractors place authorized controlled materials orders (ACMO's) on the controlled materials producers or distributors. Subcontractors are informed by their prime contractors that they will self-authorize ACMO's for certain quantities of the controlled materials, which were included on the prime contractors' DMS-4A or 4C applications. Other subcontractors must self-authorize ACMO's for only those quantities of controlled materials needed to fill rated orders that they have received and accepted. The ACMO's can be considered as the checks issued against the set-asides, or the bank, as mentioned earlier. If the producer's set-aside is filled or order leadtime has commenced, he may reject ACMO's, except those identified with a DX suffix. In such cases contractors must shop with other producers for placement of their orders, thus forcing an equitable distribution of rated business with all producers of the controlled material involved.

Under the simplified Defense Materials System today, allotment records are kept only by the prime contractors to minimize workload and costs in industry. Subcontractors do not keep allotment records since the prime contractors write-off on their books the quantities that they inform the subcontractors to self authorize.

Monthly and quarterly usage reports of the controlled materials are submitted through the same Government channels by OASD (I & L) and the Atomic Energy Commission to the Office of Emergency Planning. Quarterly shipment reports are submitted to the Business and Defense Services Administration by the controlled materials producers and, in turn, to the Office of Emergency Planning. These data are used to assess the impact of rated business on the national economy.

The next question that arises is how does a contractor obtain ratings to acquire timely deliveries of capital equipment, including production equipment and scientific and technical equipment to be privately owned, primarily needed to produce rated business. The procedure is to file a DOD Form 691 with the nearest Defense Contract Administration Services office. Need for such equipment will be validated by a production representative from that local office and the application will be forwarded by that office to the procurement contracting officers having jurisdiction over the contract or contracts. The procurement contracting officers have delegations, in most instances, to assign a contractor the right to apply a DX or DO rating on his purchase order to obtain such equipment, if it is absolutely necessary to perform DX or DO rated contracts and if similar equipment is not available in his plant.

Now a contractor has reached the point where everything is under way with no problems for the timely deliveries of the items ordered on his rated contracts. Supporting contracts, orders, and ACMO's, as well as those of his suppliers have been placed, accepted and scheduled in accordance with the BDSA rules. These rules require DX- and DO-rated contracts and orders to delay non-rated or commercial orders, if necessary. If conflicts arise between DX- and DO-rated orders, DX orders override DO orders. If conflicts arise in the DX-rated group of orders or the DO-rated group of orders, date of receipt of such orders at the suppliers plant governs. If orders were received, in either the DX or DO groups on the same date, the order with the earliest delivery date is given preference.

As stated, a contractor is now theoretically ready to make timely deliveries under his contracts. However, a change in battle plans necessitates earlier deliveries under his contracts; or he discovers that his forging sup-

plier had a breakdown on his 20,000-pound hammer and his forgings will be three months late; or he finds out that his purchasing agent forgot to order some part necessary to complete the job which has a leadtime of several months; or the steelsheet controlled materials producer is on strike and he does not know when he can ship his order.

For these situations and to legally change the delivery dates established under the BDSA rules and regulations, we have been operating a Special Assistance Program since 1950.

Under this program a contractor may file for special assistance to break temporary bottleneck situations to keep DX- or DO-rated business on schedule or to request aid for timely order placement. A standard BDSA application, known as BDSAF-138, is used by all defense agencies and their contractors. This application is usually filed by the contractor, and again, with the nearest local Defense Contract Administration Services office. The 138 application will be validated by a production representative of that local office and forwarded to certain designated points in Washington, D. C., through the cognizant procurement contracting offices; or other designated offices, such as the Joint Aeronautical Materials Activity, Wright Patterson AFB, Ohio, which has DMS and priorities responsibility for the overall aircraft program, known as the A-1 program.

There are seven DOD offices in the Washington, D. C., area authorized to review these applications, sign and forward them to BDSA. They are:

- Deputy Chief of Staff, Logistics, U. S. Army.
- Army Materiel Command, U. S. Army.
- Office of Chief of Engineers, U. S. Army.
- Naval Material Command.
- Deputy Chief of Staff, Systems

the supplier, the conflicts are referred to OASD(I&L) for resolution. Representatives from the Military Departments or defense agencies involved in the conflict are called in and we try to resolve the conflict by validating need dates, reducing needs to bare minimums, and determining the urgency of the programs involved at that point in time. If the conflict cannot be resolved to the mutual satisfaction of the representatives involved in the conflict, the DOD Master Urgency List is again used, as the last resort, with the conflict being resolved in favor of the program of the higher urgency. Then BDSA, using its priorities powers, directs the supplier to deliver in accordance with the needed delivery date or with a sequence of delivery dates, as the case may be, as recommended by OASD (I & L).

During the past year, the case load has increased substantially for two main reasons: because of the increased military procurement for Southeast Asia and because of the compression of procurement schedules. As a result, production resource difficulties have, and are, being experienced in a number of areas such as forgings, extrusions, electronic components, copper and copper products, machine tools, textiles and clothing items and certain chemicals.

Our experience has shown that as much as an average of two or three weeks can elapse from the submission of a BDSAF-138 application by a contractor until corrective action is taken by BDSA. For urgent Vietnam cases, a short cut procedure was put into effect in August 1965, whereby BDSA will accept telephonic requests from our seven designated Washington offices and action will be initiated immediately. However, such requests must be supported with the submissions of BDSAF-138 applications as soon as possible after such requests

ness and because of its large distribution. Over 10,000 copies are distributed. The Defense Contract Administration Services offices also have standard priorities and allocations instructions, issued as part of their Production Manual. These instructions are based on, and consistent with, those contained in the DOD Priorities and Allocations Manual.

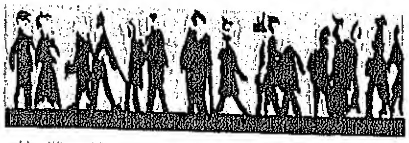
This article has covered DOD procedures related to priorities, the Defense Materials System, the Special Assistance Program, and the use of the DOD Master Urgency List in relation to priorities and the Special Assistance Program. It is hoped that it will be helpful to the readers of the *Defense Industry Bulletin*, especially to those in industry, in understanding the manner in which these closely interrelated systems function. There are important benefits to be gained by DOD, defense related agencies and industry through the proper use of priorities and allocations authorities. Using these authorities and procedures, industry should be able to schedule DX- and DO-rated business to fulfill contract delivery schedules with the minimum disruption to normal commercial business. Since the defense take of the Gross National Products is still less than 10 percent, it is felt that industry can schedule and make timely deliveries of DX- and DO-rated contracts and orders, in most instances, without major disruption to commercial business.

New Anti-Tank Weapon To Be Tested

Test firing of the Army's Medium Range Anti-tank/Assault Weapon System (MAW) will begin next spring on an overland range at Cape Kennedy, Fla.

Weighing 27 pounds, MAW is the Army's answer to the front line soldier's need for a guided missile system light enough to be carried by one man, to be shoulder fired and yet having a warhead big enough to destroy most armor and other infantry targets. MAW will be superior in range, accuracy and lethality to the 90mm recoilless rifle which it replaces.

Development firings will be conducted by McDonnell Aircraft Corp., MAW prime contractor, under the direction of the Army Missile Command which manages the weapon system at Redstone Arsenal, Ala.



ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Maj. Gen. William A. Enemark, USA, has been designated as Senior Army Member, Military Studies and Liaison Div., Weapons Systems Evaluation Group, Office of the Dir., Defense Research & Engineering.

Dr. Cody W. Wilson has been appointed Dir. of the Behavioral Sciences Office in the Advanced Research Projects Agency, succeeding Dr. Lee W. Huff.

Dr. Patrick J. Friel has been appointed Dir., Ballistic Missile Defense, Advanced Research Projects Agency, succeeding Dr. S. J. Rabinowitz who has returned to Columbia University.

Dr. Carl Walske has been sworn in as Asst. to the Secretary of Defense (Atomic Energy) and Chairman of the Military Liaison Committee to the Atomic Energy Commission.

Richard C. Steadman has been appointed Dep. Asst. Secretary of Defense for Far Eastern Affairs, Office of Asst. Secretary of Defense (International Security Affairs).

C. A. Fowler was sworn into office Oct. 12 as Dep. Dir., Defense Research & Engineering for Tactical Warfare Programs, succeeding Dr. Thomas P. Cheatham who has returned to private business.

Brig. Gen. Hal D. McCown, USA, has been designated as Dir., Ground Munitions Office, Office of Asst. Secretary of Defense (Installations & Logistics).

Capt. Kenith V. Lindstrom, USN, has been designated as Dir., Air Munitions Office, Office of Asst. Secretary of Defense (Installations & Logistics).

Capt Victor A. Dybdal, USN, has been ordered to new duty as Dep. Dir. for Plans, Defense Communications Agency.

The following assignments have been made in the Office of the Asst. Secretary of Defense (Public Affairs): **Robert W. Harvey** reassigned from the Directorate for Defense Information to be Special Asst. for Audio-Visual to the Asst. Secretary; **John C. Kirby** reassigned from Executive Assistant to the Asst. Secretary to be Chief, OSD Div., Directorate for Security Review; **William E. Odom** reassigned from Dir. of Defense Information to be Special Asst. to the Asst. Secretary; **Col. Winant Sidle,** USA, nominated for promotion to brigadier general, reassigned from Special Asst. to the Asst. Secretary to be Dir. for Defense Information; and **Lt. Col. Harry J. Maihafer,** USA, reassigned from Chief, Business Branch, Directorate for Community Relations, to be Executive Officer to the Asst. Secretary.

DEPARTMENT OF THE ARMY

Dr. Russell D. O'Neal has been sworn in as Asst. Secretary of the Army, (Research & Development). He was formerly the Vice President of Aerospace Systems, Bendix Corp.

Col. Lawrence R. Klar and **Col. William C. Neubauer** have assumed new duties with the U.S. Army Strategic Communications Command. Col. Klar is serving as the command's Chief of Staff and Col. Neubauer has been appointed Commanding Officer of continental U. S. operations.

Col. Sterling H. Abernathy has assumed newly assigned duties as Comptroller and Dir. of Programs for the Army Missile Command, Redstone Arsenal, Huntsville, Ala. He succeeds Col. David Marcelle who has been transferred to the Office of the Comptroller, Department of the Army.

DEPARTMENT OF THE NAVY

The Navy's David W. Taylor Model Basin, Carderock, Md., is getting a new commanding officer and a new technical director. **Capt. Manuel Vincent** has been reassigned from duty with the U.S. Navy Mission to Brazil to duty as Commanding Officer of the Model Basin. **Dr. Alan Powell** has been appointed to the position of Technical Director. He has served as Head of the Acoustics and Vibration Laboratory since January 1965.

Col. Howard E. Wertman, USMC, has reported for duty as Chief of Staff, Marine Corps Supply Activity, Philadelphia, Pa. He comes to the new assignment from duty as Commanding Officer, Third Force Service Regiment, at Okinawa.

DEPARTMENT OF THE AIR FORCE

General **Hunter Harris Jr.,** Commander in Chief, Pacific Air Forces will retire from the Air Force on Jan. 31, 1967.

Maj. Gen. Neil D. Van Sickle has been named Dep. Inspector General for the Air Force.

Brig. Gen. Albert W. Schinz has been reassigned from duty in Vietnam to a new assignment as Commander Air Force Tactical Air Warfare Center, Eglin AFB, Fla.

Beril Edelman, Industry Relations Manager of Western Electric Co., Inc., has been named a consultant to the Dep. Under Secretary of the Air Force (Manpower).

Dr. William B. Simecka, former Navy consultant, has been named Chief Scientist of the Air Force Armament Laboratory, Eglin AFB, Fla.

Col. Robert Muldrow has been appointed Vice Commander, Air Force Missile Development Center, Holloman AFB, N.M., replacing Col. Lee L. Peterson. Col. Peterson has been serving in the dual capacity of Vice Commander and Chief of Plans and Requirements since Col. William Cleveland's retirement last July.

New assignments in the Air Force Systems Command (AFSC) are:

Arthur G. Wimer Jr., Chief Scientist succeeding Dr. Bernhard H. Goethert; **Brig. Gen. Henry B. Kucheman Jr.,** Vice Commander, Aeronautical Systems Div.; **Col. Robert M. White,** Chief, Tactical Systems Office, Dep. for F-111, Aeronautical Systems Div.; **Col. Spencer S. Hunn,** Dep. for Tactical Systems, Electronics Systems Div.; **Col. Francis J. Dillon Jr.,** Dep. for Surveillance and Control Systems, Electronics Systems Div.; **Col. Charles G. Johnson,** Chief, Tactical Planning Division, Directorate of Planning and Technology, Electronics Systems Div.; **Col. Conrad R. Peterson,** Dir., 458/490L Engineering Div., Electronics Systems Div.; **Col. Ralph A. Newman,** Chief, Resources Support Office, Systems Engineering Group; and **Col. Raymond S. Sleeper,** Commander, Foreign Technology Div.

New assignments in the Air Force Logistics Command are:

Col. Paul E. Greiner relieves Maj. Gen. C. B. Root as Commander, Mobile Air Materiel Area, Brookley AFB, Ala.; **Lt. Col. E. Vince Moyer,** Chief, Office of Information, Warner-Robins Air Materiel Area, Robins AFB, Ga.

Radiography Handbook Available

DOD Handbook H-55 titled "Radiography," is now in distribution throughout Government and industry. The publication is the second in a series of non-destructive testing handbooks which were developed by the Army Materiels Research Agency and published by the Office of the Assistant Secretary of Defense (Installations & Logistics).

The handbook provides technical guidance to quality and reliability assurance personnel concerned with non-destructive testing techniques used in the detection of discontinuities and other material defects in metals and non-metallic products.

The document is available for purchase from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $1.25 a copy.

A common defense market

by

Leonard A. Alne
Dep. for Weapon Systems Planning
Office of Dep. Asst. Secretary (International Logistics Planning)
Office of Asst. Secretary of Defense (International Security Affairs)

It would be fair to acknowledge that the world has not in general queued up to join what Secretary McNamara introduced, in Paris in May 1965, as the Common Defense Market. As a matter of fact, one defense minister is reportedly of the opinion that his substantial orders for U.S. defense equipment have nothing to do with any Common Defense Market.

Perhaps our problem lies in those capital letters. No one has yet established, or promised to establish, a *Common Defense Market* but, like Moliere's character who was astonished to learn he had been speaking prose all his life, we may indeed be well into the establishment of a *common defense market.*

Certainly, a "common defense" has been affirmed by most of the free world—by the terms of the treaties of the North Atlantic Treaty Organization, the Southeast Asia Treaty Organization and the Central Treaty Organization and by repeated subsequent confirmations. But has this identification with a common defense led to a common marketplace for defense equipment? The answer depends on what test you apply. It happens to be yes if one compares free world cross-border defense transactions with those of the European six-country common market (whose existence no one challenges)—both relative to the levels of domestic transactions. In 1964 the six-country exports within the common market amounted to $18.4 billion or about eight percent of the gross domestic product at factor cost of $421 billion in those countries during the same year. These data reflect the success of the common market in that exports within the six countries during the period 1958 to 1964 increased 168 percent.

Now, with respect to cross-border transactions within the free world involving defense hardware, the United States alone, during the four and one-half years after June 30, 1961, has received orders valued at about $6.8 billion (and commitments for another $3.7 billion). During these same years, the defense budgets of the free world countries outside the United States made available about $45 billion for defense hardware. On an order-and-commitment basis, therefore, they ordered from the United States about 25 percent of their defense hardware procurements. United States receipts on these orders were about $6 billion or about 13 percent of the defense hardware budgets of the six countries. Our allies have demonstrated, therefore, a willingness to spend about one dollar in every eight for defense hardware procurements from the United States. During the same period, U.S. defense expenditures abroad total about $12.3 billion (not including expenditures associated with Vietnam) of which about $700 million was for defense equipment—the predominant remainder being for troop deployment costs.

It can be argued, therefore, the $6.7 billion in free world defense hardware cross-border transactions, during a four and one-half year period, constitutes sufficient evidence to permit the assertion that a common defense market does, in fact, exist.

But whatever real progress has been made so far toward a common defense market, what are the prospects for further progress? Any such prediction rests on an amalgam of economic, technical and political realities.

The Economic Argument.

Economically, the case for a common defense market is unshakable. No one can dissent from the thesis that if Country A can build one radar system or two ships with one unit of labor and capital, and Country B can build two radar systems or one ship with one unit of labor and capital, then the two countries, each spending two units of labor and capital, have the choice of:

> Country A building one radar and two ships, Country B building two radars and one ship, for a total of three radars and three ships;

or, by cross-servicing one another through trade,

> Country A building four ships, Country B building four radars, for a total of four radars and four ships.

The better economic choice is clearly the latter.

It is less obvious, however, that the same result in lesser degree obtains when a country has no natural advantage over another country in any field of defense equipment. Suppose Country C with one unit of labor and capital can produce either 15 radios or one truck and that Country D with a similar unit can produce 10 radios or half a truck. D is disadvantaged in both items but its disadvantage in radios is less. Now, if each country, insisting on self-sufficiency, devotes one unit of labor and capital to radios and two units to trucks, they can produce:

> Country C, three units, building 15 radios and two trucks; Country D, three units, building 10 radios and one truck, for a total of 25 radios and three trucks.

However, if each decides to produce that concerning which it has the greatest comparative advantage or least comparative disadvantages, C will produce trucks and D will produce radios:

> Country C, three units, building three trucks; Country D, three units, building 30 radios, for a total of three trucks and 30 radios.

With such specialization, C and D have gained five radios. To make trade feasible, they could agree on prices such that one truck is equivalent to 18 radios, in which case:

> Country C would receive 18 radios and two trucks; Country D would receive 12 radios and one truck.

There would be gain for C of three radios and for D of two radios relative to their independent ability as given in the first situation above. D, of course, continues disadvantaged in total product relative to C but both countries gain by virtue of their agreement to trade.

The economic moral is clear. The defense technology advantage of the United States is great—not because of intelligence, of course, but because of the breadth of its research and development effort and its relatively longer production runs against which

on-recurring costs can be amortized. ut even with such a natural general dvantage in the United States, the enefits of specialization and trade ccrue to both the United States and a maller country even when the smaller ountry finds itself disadvantaged in ll fields of defense technology. And uch across-the-board disadvantage is t least unusual if it does exist at all.

he Technical Argument.

A single current high-performance actical aircraft costs today about 120 imes as much as the best similar but hardly equivalent) aircraft of arly World War II. Defense techology has indeed become incredibly ostly and the ability of even the argest of the free world countries to ay for, let alone produce, the whole rsenal of sophisticated defense is eing severely tested. Given the enorous need to devote public resources non-defense efforts, it has been unvoidable for some time that deense ministers weigh very carefully hether to develop and produce at ome those items of defense hardware hich can be procured much more onomically abroad. This technologil cost-effectiveness thrust has been eating a common defense market for e last five years, whether the phrase a happy one or not, and will connue to do so until the need for dense vanishes.

he Political Argument.

It must be remembered that a comon defense market differs from a vil sector common market in that fense procurement comes under the ght control of governments; is osely associated with national serity; and is large in value and reives, therefore, careful decisionaking analysis. The six countries in rope recognized these differences excluding military procurement om the categories of transactions ming under trade liberalization thin the community, and it should generally recognized that a formal mmon Defense Market is more amtious than any similar effort in the il sector and has not, in fact, been ed.

These differences, characteristic of fense procurement, compel defense nisters to take into account:

- The need, at whatever cost, for ablishing and maintaining a dense production base at home for ected items.
- The labor and individual capability for and interest in domestic production.
- The availability of foreign exchange.
- The incremental differences in security, cost and quality between buying at home and buying abroad.
- The political merit and impact of each of the options.
- The priority of actions required to maintain an effective defense force.

One cannot write a scenario for this process of analysis even in the general case. But the process does go on continuously in each government and the results are visible. Defense ministers, by their decisions in the face of economic, technical and political imperatives, are forming a common defense market.

The United States Role.

Candor suggests that the United States now stand up and be counted in regard to its intentions on any common defense market. Very simply, is it willing to buy defense equipment abroad in the light of the same imperatives which it sees confronting its allies?

The answer is yes, but the imperatives need some illumination. Economically, the United States is, by some measure relevant to defense, about twice as large as its allies combined. With a $7 billion annual investment in research and development and with defense production runs averaging an order of magnitude higher than that of any other ally, the scale of U.S. defense procurement brings in train a scope and machinery of management so broad that the competitive entry of a foreign government or firm into the process is not simple to arrange. Nevertheless, it can be done—witness the Canadian success in winning DOD orders averaging over $200 million annually during the last few years, and British success in winning DOD orders in the amount of about $125 million so far under the F-111 arrangement (including a Rolls Royce engine for the USAF A-7 aircraft).

The theory of "least comparative disadvantage" noted above is quite valid but the DOD military procurement officer, charged with a large complex program with tightly scheduled performance dates and burdened with uncompromising users on the one hand and obstreperous laws of physics on the other, is not likely to be much preoccupied with the subtle opportunities presented by economics.

Technically, there is promise. We know that there are fields in which our allies excel—aircraft engines from the UK, signal generators from Germany, anti-tank weapons from France, just to take some examples. We know that every country will continue to bend every effort toward achieving a recognized technical superiority (we would think in selected fields when the whole spectrum of defense technology cannot be covered) and we know that good ideas distribute themselves rather evenly among the human race.

Politically, we have a Buy American Law and an exquisite balance of payments problem. The law dates from 1932 and the Secretary of Defense does not exercise the exceptions provided by it in any casual way. The balance of payments problem is hopefully more short term but, until the world-wide liquidity problem is solved, may remain with us as long as U.S. defense foreign exchange expenditures remain substantial.

Nevertheless, politically, there is a highly significant fact that promises a U.S. willingness to participate in the steady growth of a common defense market. The United States believes it is in its interest, as well as the interests of its allies, to encourage the adoption of rules of the road under which each country can have a chance to realize its technological potential and aspirations and contribute thereby to the common achievement of the common defense. The United States will probably not be willing to move any faster than any other country in expanding off-shore defense hardware procurement. The United States will compete hard and will expect hard competition, but it does want to build and keep the arena in which that competition can take place. And it does want the other teams to be there. Allies, who may doubt this, should challenge the United States, not in terms of generalized debate but in terms of specific arrangements and requirements figuring significantly in the decision-making process of each defense ministry.

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Military Handbook on Rubber Available

A new handbook titled "Rubber and Rubber-Like Materials," MIL-HDBK-149A, which gives the latest information on rubber materials, is now available to the public.

The handbook is intended mainly as a source of technical information and design data for engineers and designers of military equipment.

Different types of elastomers are included in the booklet, with pertinent information on their resistance to fluids and weathering, physical and electrical properties, design data and suggested applications.

Copies may be obtained from the Naval Supply Depot (DCI), 5801 Tabor Ave., Philadelphia, Pa., 19120.

AFFTC—Keyed to Future Requirements and Today's Needs

By
Maj. Gen. Hugh B. Manson

Leadership today—both industry and military—must be keyed to thinking in terms of far-into-the-future requirements as well as being prepared for sudden change or modification of present-day products and programs.

This concept is an everyday mode of living and operating for those of us at the Air Force Flight Test Center (AFFTC), Edwards AFB, Calif.

Perhaps best illustrative of our concept, of the many test programs currently under way at this huge Mojave Desert installation, is the XB-70A. Originally conceived as a follow-on bomber to replace the B-52, in the decade of its turbulent development from the drawing board in 1955 to its first flight in 1964, the designated use of this unique craft went through a series of changes from bomber to sophisticated surveillance system (RS-70) before its ultimate utilization as a vehicle for conducting research, including supersonic transport (SST) research.

Although practical operation of the SST is not envisioned for several years to come, at least three other test programs presently active at Edwards are directly or indirectly concerned with it. These are the SR-71/F-12 (Air Force-Lockheed), F-111 (Air Force-General Dynamics) and X-15 (Air Force-National Aeronautics and Space Administration-Navy) —all of which have features under study for incorporation into SST design.

During my first tour of duty with AFFTC (1959-60) as its deputy chief of staff for operations, the X-15 rocket plane made its initial powered flight. Shortly thereafter, AFFTC received the first of three X-15's built by North American Aviation and turned it over to the National Aeronautics and Space Administration's (NASA) Flight Research Center at Edwards for the then planned 50-mile and 4,000-miles-per-hour space probe research program.

Since that time this remarkable trio of scientific research craft have made approximately 160 flights during which they have well exceeded the original program goals—setting the current speed record of 4,104 miles per hour with the number one craft in June 1962, and the current unofficial altitude record of 354,200 feet in August 1963 with number three.

Plans now call for programming a speed of Mach 8 and altitudes of over 400,000 feet utilizing the rebuilt number two X-15 (wrecked in a November 1962 crash at Mud Lake, Nev.). It has been modified to carry an additional 13,500 pounds of propellant in external fuel tanks, and is 29 inches longer with a height increase of 19 inches.

In addition to the X-15's specific design mission of obtaining data on hypersonic aerodynamics, problems of reentry heating, physiological and psychological problems, and the effectiveness of reaction controls, future projects programmed through 1967 include: high altitude sky brightness, micrometeorite collection, ultraviolet stellar photography, heat exchanger program, atmospheric density measurements, horizon scanning and definition, advanced integrated data system for future aerospace vehicles, rarefied wake flow experiment, supersonic decelerators, and high temperature leading edges for dissipation of extreme temperature effects.

The millions of bits of data gathered on these flights have had and will have an immeasurable effect upon our manned space program as well as the design and construction of future supersonic vehicles such as the SST-type craft. Tied together with other millions of pieces of data garnered by the XB-70, plus the performance evaluations of the titanium-honeycomb constructed, delta-winged SR-71's and YF-12A's along with the swing-wing F-111, should give our nation's aviation industry a wealth of SST background information enjoyed by no other country in the world.

Maj. Gen. Hugh B. Manson, USAF, is Commander, Air Force Flight Test Center, of the Air Force Systems Command. Prior to this assignment he was Commander of the Systems Engineering Group of AFSC's Research and Technology Div. He is a command pilot with over 4,500 hours flying time.

The unique working relationship at Edwards between AFFTC and the contractor has paid off in a number of fashions with two main advantages heading the list. First, communication between user and builder is greatly simplified—men can sit down together and discuss problems after a five-minute drive rather than after a cross-country trip involving hundreds of dollars of travel monies. Many contractors have extensive facilities on base.

This advantage of physical proximity also allows a first hand "over the shoulder" look at problems and progress as results come in. The resulting ease of cooperation and coordination has been a great time saver.

The first Minuteman silo launch is a good example. At the start of my initial tenure at Edwards a tethered full-scale Minuteman solid propellant missile was successfully fired from a silo here by the Directorate of Rocket Propulsion and Missiles—now the Air Force Rocket Propulsion Laboratory. Boeing and Air Force personnel were working together at the same place at the same time with a common goal. It was a team effort.

Less than nine months later, the eighth of 18 scheduled full-scale Minuteman firings by The Boeing Co. became the final firing due to the program's success. Today, the Strategic Air Command has Minuteman I missiles on alert in underground launchers in five midwest states. Installation is also under way for improved Minuteman II missiles in one of these states and in one ad-

ditional state. Minuteman II will begin to replace Minuteman I this year.

Another very highly successful test program in this line, which amply illustrates the thesis of thinking ahead and being prepared to modify program goals due to an unusual situation, was that of the Lockheed C-141 aircraft Category II testing.

Originally, one of the main mission objectives for the C-141 Joint Test Force called for approximately 1,000 hours flying time on one of the test aircraft during the 12-month period (1964–65) scheduled for the overall test program. This was estimated to be the equivalent of about two years normal flying time for a Military Air Transport Service (now Military Airlift Command—MAC) transport aircraft, which was to be the prime user of the C-141.

However, far exceeding all anticipated expectations, this C-141, flying out of Edwards, logged its initial 1,000 hours in just six months. The joint test force then promptly upped its overall test program goal to 1,800 hours. Relatively trouble-free operation allowed flying up to 15 hours a day—three times normal MAC utilization. On one occasion it remained aloft over 18 hours unrefueled and later made a 6,535-mile non-stop flight. This caused the test force to shoot for a 2,000, then 2,400 and, finally, an unheard of 2,500 hours on this airplane for the 12-month period ending in June 1965. The goal was actually achieved in a little over 11 months. This is a fine tribute to the smooth functioning of the close-knit Air Force, Lockheed, subcontractor, vendor and Army liaison personnel which comprised the C-141 Joint Test Force.

Although less than 30 days after becoming operational in August 1965, the C-141 was providing the big muscle for MAC's airlift strength with daily flights to Vietnam transporting cargo and troops to Southeast Asia and bringing back wounded, there had long been an obvious need to develop an even newer, larger, long-range cargo aircraft to replace the aging C-124's and C-133's. Before the first prototype of the C-141 rolled off the assembly line in the spring of 1964, a study project was well under way at DOD and U. S. Air Force headquarters tabbed Cargo Experimental-Heavy Logistics System (CX-HLS), for the development and procurement of this new jet transport aircraft.

This aircraft was later designated the C-5A and, on Dec. 31, 1964, project definition phase contracts were awarded by DOD to Boeing, Lockheed and Douglas for the airframe, and to General Electric and Pratt and Whitney for the engine competition. On Sept. 30, 1965, it was announced that Lockheed had been selected to develop and produce the aircraft with General Electric as manufacturer of the C-5A's 40,000-pound-thrust fan jet engines.

The C-5A is being purchased under a new contracting concept known as "total package" procurement. Under this concept, one contract is awarded for development, production and support of the aircraft, including spare parts and ground equipment. This differs from previous procurement programs wherein one contract was awarded for development work and another for production. Under the total package concept, the aircraft manufacturer is responsible for total performance of the aircraft as an integrated system.

Construction of C-5A test facilities at Edwards is expected to get under way in April 1967, and the target date for our first test aircraft is October 1968. It will become operational in 1969.

An area of research at Edwards in which we have been vitally interested for more than a decade has been that of the V/TOL (Vertical Take-Off and Landing) aircraft. Currently under test are the U. S. Army XV-5A lift-fan research plane and the tri-Service XC-142A tilt-wing transport—both of which appear to have great potential.

Although each has the capability of taking off and landing vertically in an area slightly larger than that of a tennis court, they employ totally different design techniques and principles. Both aircraft are the result of a combined effort on the part of several different aircraft and engine companies.

The Ryan Aeronautical Co. XV-5A, powered by two General Electric J-85 jet engines, embodies the lift-fan principle to accomplish its V/STOL (Vertical/Short Take-Off and Landing). This consists of three fans—two five-foot diameter lift fans, one in each wing, to provide lift for vertical take-off and landing, and a smaller nose fan used to provide lift, pitch trim and control—which function through a combination of positioning inlet and exit louver doors above and below the fans. Valves divert the main jet exhaust flow to power the fans for vertical flight. For forward flight, the diverter valves close off ex-

The X-15 research vehicle, which has been designed to probe the fringes of space, is released from its B-52 mother ship.

haust gases to the fans and allow operation as a conventional jet aircraft.

Two of these aircraft were built, with the first conventional flight in May 1964, and first hovering flights in July of that same year. Although one was lost in April 1965, the program is progressing.

A pioneer in the area of V/TOL, this is not Ryan Aeronautical's first effort in the field. Back in the fall of 1955 Ryan brought to Edwards a sleek, delta-winged craft called the X-13 Vertijet which was destined to become the world's first jet V/TOL aircraft. The design, fabrication and testing of the X-13 was an Air Force program, but behind it stood nearly 10 years of Ryan-Navy research sponsored by the U. S. Navy.

Ling-Temco-Vought, Inc., supported by Ryan and Hiller aircraft companies, developed and built the XC-142A. It is the world's largest V/STOL aircraft and the first developed by this nation for operational evaluation rather than the testing of a concept. A combined program of the Air Force, Army and Navy, it is also the nation's first of three tri-Service V/STOL aircraft programs.

The XC-142A is a four-engine, turboprop, high-wing transport airplane which uses the tilt-wing, deflected slipstream concept to achieve V/STOL operation. It is powered by four General Electric T-64-GE-1 turboshaft engines which drive four Hamilton Standard lightweight fiberglass propellers, each 15.6 feet in diameter, plus an eight-foot tail rotor and accessory equipment. All four engines are linked together by a unique interconnected drive shaft system so that even a single engine can turn over all four propellers and the tail propeller.

Part of a system designed for swift transport of combat troops, equipment and supplies from assault ships or airfields into unprepared areas under all-weather conditions, it is capable of speeds that belie its squared-off appearance. The airplane will be able to take off and land vertically in all types of terrain and achieve a top speed of more than 430 miles per hour in level flight.

Five XC-142A aircraft were constructed under the DOD contract awarded to Ling-Temco-Vought. Two of these aircraft were delivered to the Tri-Service V/STOL Test Force at Edwards during the summer of 1965, two additional ones in April 1966, and the last one in May 1966. More than 250 flights and 225 flight hours have been accomplished to date with some 25 pilots, including 15 military, having flown the aircraft.

The huge number of helicopters and the vast extensiveness of their operations in Southeast Asia have contributed a great deal to the tremendous potentiality of these V/STOL-type aircraft and their impact on the future of aviation.

Just as Southeast Asia helicopter actions have intensified the development of the V/STOL program, so have other applications of the unique type of jungle war practiced in this theater caused the Air Force Systems Command and AFFTC to take a second look at the Air Force aircraft inventory—past and present—as well as that of our sister Services, the Navy and Army, for solutions to some of the problems.

Accustomed to dealing in the terms of more sophisticated Mach 2 and Mach 3 aircraft, we have had to readjust our thinking to the era of the subsonic. Supersonic fighters and fighter bombers, on low level missions, are hindered by their speed in proper target identification. They also have limited "time on station" or loit capability and are unable to thrott back sufficiently for helicopter escor

These factors proved that, contra to popular thinking, the era of tl World War II propeller-driven ai craft was not ended, but needed to l revitalized. Dipping back into Worl War II stocks, we brought out of r tirement one of the hottest twir engine bombers of its day—the B-2 Invader—which was modified by th addition of a bigger and stronge wing plus more powerful engines fo the operations envisioned. After mod ification the aircraft underwent Cate gory II testing at Edwards during 1964-65 and is now on operational duty with the 1st Air Commando Wing at Hurlburt Field, Fla., as the B-26K.

Another doughty warrior of World War II fame, which has proven to be an excellent all-purpose aircraft in the field in Vietnam, is the Douglas A-1E Skyraider, a propeller-driven, single-engine fighter/fighter bomber which was obtained from the Navy. Now under consideration as a follow-on jet replacement for the A-1E is the Navy's subsonic A-7A Corsair II, a light ground-attack aircraft developed by Ling-Tempo-Vought to meet the specific requirements for attack

The B-26K, a modified and modernized World War II B-26, is a light bombardment aircraft designed for use in support of Air Force counterinsurgency operations.

and close support warfare. We expect to have this aircraft for Category II testing at AFFTC.

As an outgrowth of Southeast Asia effort, the U. S. Army Aviation Test Activity at Edwards will begin two tests sometime this fall. The first is the armed fighter-configured version of the Bell UH-1 helicopter, named the Huey Cobra. The second will be the armored "gun-platform" version of the Boeing-Vertol CH-47 in various weapons combinations of from seven to 10 guns or cannons plus grenade and rocket launchers.

From the foregoing examples of AFFTC test and support activities, it is clear that the center satisfies more than just the needs of the Air Force Systems Command. Our facilities are utilized to some degree by NASA, Army, Navy, Air Force operational commands, contractors and friendly governments. In this latter category, test work has been done for and by the German and Norwegian governments. At present we have under way testing of the Northrop-Norair CF-5A by the Royal Canadian Air Force and in the future AFFTC will support the F-4K (British) tests by McDonnell Aircraft for the Air Force and Great Britain.

Assistance to the commercial aviation industry is also of vital concern to us and practically every major U. S. jet airliner flying today has tested its wings in some aspect at Edwards facilities. Currently under way is a year-long test program by Douglas Aircraft of the new elongated DC-8 Super 61. These tests of purely commercial products are conducted on a non-interference basis and all costs incurred are reimbursable.

What does the future hold in store for the AFFTC? Aside from the SST, major test programs now in the planning stage include the AMSA (Advanced Manned Strategic Aircraft), B-111A, V/STOL strike-reconnaissance fighter, advanced V/STOL fighter, advanced V/STOL light transport (CV-X), V/STOL intratheater transport (CV-6) and the manned hypersonic vehicle.

With regard to the latter, preliminary tests already are under way by NASA and the Air Force at Edwards with lifting bodies (M2-F2 and HLS-10). In addition our telemetry and tracking facilities are now tied in with, or will be tied in with, the Air Force Western Test Range and the Navy Pacific Missile Range and in the easterly direction to facilities located at Wendover, Utah. The Edwards area represents one site for land recovery of space vehicles, especially when the western hemisphere's largest natural landing area is added —Rogers Dry Lake, 29,632 acres or 46.3 square miles. Summed up, we like to think of the Air Force Flight Test Center and Edwards AFB as having this potential to contribute to the nation's space effort.

High-Speed Computer Printouts Under Study

Precise control of a laser's intense coherent light to position a beam to any of 131,072 points, within a space smaller than a match head and at speeds exceeding 100,000 selections per second, is under Army study for high-speed computer printouts.

Now in exploratory development at the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J., the experimental equipment was produced under contract by the Systems Development Division of International Business Machine Corp.

Considering its potential to store data, provide printed readouts and project images, ECOM scientists envision a system in which such inputs as typed material, charts and line drawings could be fed into a computer. Relayed hundreds of miles by radio to another computer, they could be processed and reproduced instantly as printed pages or as greatly enlarged screen displays.

ECOM's experiments with the equipment are being carried out by the Display Techniques Team of the Communications and Automatic Data Processing Laboratory headed by Colonel George M. Snead Jr. Pierce Siglin is the team leader and Erich F. Kral is project engineer.

New Landing Mats Tested by Military

Tri-Service testing of a new landing mat for use in construction of military airfields is now being conducted at Dyess AFB, Abilene, Tex.

Tests will include airfield construction, landing and takeoffs by a variety of military aircraft, and recovery and disposition of materials on conclusion of the tests.

Four types of metal landing mats will be installed at the test site—three made of extruded aluminum and one of a new lightweight aluminum honeycomb.

Headquarters, U.S. Air Force, is DOD executive agent for the test project.

Special Fuze Developed for Explosive Anchor

The U. S. Army has designed and fabricated a safe, reliable fuze mechanism for use with the new explosive embedment anchor being developed at the U. S. Army Mobility Equipment Center's Engineer Research & Development Laboratories, Fort Belvoir, Va.

The new fuze, which will be used to set off the propellant charge driving the anchor into the ocean floor, incorporates several special features.

Because of its underwater use, the fuze's electric components are incapsulated in a rubber potting compound to prevent failure from water leakage. In addition, circuitry is designed so that the fuze will not arm itself until it is at least 27 feet below the water surface.

Another circuitry design feature shunts the detonators to prevent premature firing before the instant of impact. As additional safety features, the fuze will disarm itself if for any reason it is brought to the surface before the propellant is ignited or will deactivate itself completely in the event of a misfire by draining both the battery and firing capacitor in about 40 minutes.

The explosive embedment anchor is being developed as a mooring component and will replace the massive weight of ground tackle required in a conventional mooring point.

Weighing 4,600 pounds, the experiment anchor can do the job of conventional ground tackle weighing about 33 tons. Incorporated in a multileg mooring system, it will permit safe mooring of tankers of up to 40,000 dead weight tons.

MTMTS Operations Booklet Available

"Military Traffic Management and Terminal Service—An Instrument of National Policy," an illustrated 32-page booklet which describes the responsibilities, organizational structure and operational procedures of Military Traffic Management and Terminal Service (MTMTS), is available to the public.

Produced by the MTMTS Office of Information, the publication stresses the fact that one of the most important ingredients in the field of logistics is transportation.

MTMTS was organized two years ago and directs, controls and manages the movement of all military traffic in the United States.

Copies of the booklet can be obtained by writing to Commander, Military Traffic Management and Terminal Service, Washington, D.C. 20315.

Civilian Reserve Ready for Emergency

Three times in this century alone, emergencies demanded expansion of the Government's civilian staff. Each emergency has led to a desperate search for executive talent to staff improvised organizations. Each time, fortunately, the Government eventually was able to report its mission accomplished.

It has become clear, however, that no emergency exactly duplicates its predecessor. We all know that an emergency wholly without precedent can befall us. Hard reality tells us that waiting until disaster strikes amounts almost to an invitation to disaster. Waiting for a crisis to come is no longer acceptable.

To meet this challenge, the Executive Branch and Congress created the National Defense Executive Reserve.

The Executive Reserve is a landmark in the stream of Government history. In the past, many agencies acted individually to prepare for an emergency, but no Government-wide coordination, geared to common standards and objectives, was ever before attempted.

In 1955 the Congress enacted an amendment to the Defense Production Act of 1950 authorizing the President to establish the National Defense Executive Reserve and train its members. In 1956, under the authority of Executive Order 10660, the Federal Government began to build an organization unique in American history. Today this pool of trained civilian reservists is one more vital component of national strength in emergencies.

The Office of Emergency Planning (OEP), which coordinates in behalf of the President the broad field of emergency mobilization, coordinates the activity of the National Defense Executive Reserve. Its current authority is derived from Executive Order 11179, issued on Sept. 22, 1964.

Departments and agencies with mobilization responsibilities enroll reservists from business, labor, argiculture and the academic professions. The professional status of the members of the Executive Reserve is as follows:

Industrial Leaders:	
Firms with more than 500 employees:	49%
Firms with less than 500 employees:	28%
Federal Government Officials:	1%
State and Local Officials:	3%
Labor, Trade and Professional Society Leaders:	5%
Educators:	3%
Retired:	5%
Other:	6%

There are currently almost 4,000 members of the Executive Reserve. Most of these members are assigned as follows:

Department of Commerce	1,917
Department of Defense	93
Department of the Interior	240
Department of Labor	106
Federal Communications Commission	17
Department of Housing and Urban Development	39
Interstate Commerce Commission	759
Office of Emergency Planning	250

The Department of Agriculture is currently recruiting members for the Executive Reserve.

Criteria for Membership in the Executive Reserve.

Candidates are selected and appointed by heads of departments or agencies, with the concurrence of the Director, Office of Emergency Planning, to assist in carrying out emergency responsibilities. Generally candidates for membership are recruited by individual units or suggested by business, professional, or labor sources. Those selected are people of executive ability in specific areas.

Candidates must be fully cleared for security by the Government before they become reservists.

The reservist and his employer must sign a statement of understanding indicating the reservists may attend peacetime training sessions and, in the event of a national emergency, be available for immediate Federal employment in the area of his training. Reservists are expected to meet from time to time with their program directors or regional directors in order to keep abreast of program developments. Informational and training material usually require short reading time. (The training sessions are generally limited to two days each year.)

Reservists receive a certificate of membership in the National Defense Executive Reserve, and a letter from the head of the agency designating them as a member of a specific unit. Also, appropriate identification and assignment documents are issued to each reservist to facilitate his entrance on duty in an emergency.

The reserve unit will furnish each member specific instructions as to where to report and the nature of his responsibility in an emergency.

Reservists are trained both for general emergency work and, to some extent, for specialized experience or knowledge, but the Government may use him where he is most needed. The training program is planned to avoid undue demands on the reservist's time. Regional training conferences are held not more than twice a year and a national training conference is normally held every three years. Training involves:

- Participation in test exercises and alerts to the extent practicable.
- Attendance at periodic meetings in which mobilization programs are discussed in general.
- Personal consultation on specific mobilization problems relative to his area of competence.
- Reading of publications and other communications pertaining to plans and program—usually specifically related to the reservist's emergency responsibilities.

The reservist receives no pay for his pre-emergency training activities. When called to duty in an emergency, he will become a Federal employee and will usually serve on a salary basis under pay schedules then in effect. If circumstances require him to serve without compensation, he will be allowed to do so, providing appropriate legal authority then exists.

Obligations of members of the military ready reserve normally would bar a candidate's designation as an Executive Reservist.

With respect to training activities, Executive Reservists who are not officers or employees of the Executive Branch of the U. S. Government are exempt from the operation of sections 203, 205, 207, 208 and 209 of Title 18, U. S. Code. Executive Reservist training within the meaning of this

(Continued on Page 41)

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JANUARY 1967

SPEAKERS CALENDAR

DEPARTMENT OF DEFENSE

Maj. Gen. J. B. Bestic, USAF, Dep. Dir. for National Military Command System Technical Support, Defense Communications Agency, at Information System Science and Technology Congress, L. G. Hanscom Field, Mass., Nov. 23.

Mr. B. B. Lynn, Dep. Dir., Defense Contract Audit Agency, at the New York State Society of Certified Public Accountants Meeting, New York, N.Y., Nov. 30.

DEPARTMENT OF THE ARMY

Lt. Gen. Austin W. Betts, Chief of Research and Development, at Annual NIKE-X Management Conference, Burlington, N.C., Nov. 28–30.

DEPARTMENT OF THE NAVY

RAdm. Henry L. Miller, Chief of Information, at Navy League, San Antonio, Tex., Nov. 23; at Pearl Harbor Day Luncheon, Philadelphia, Pa., Dec. 7.

Adm. David L. McDonald, Chief of Naval Operations, at Armed Forces Staff Meeting, Norfolk, Va., Dec. 1; at Naval War College, Newport, R.I., Dec. 13; at Naval Academy Dinner, New York City, N.Y., March 7.

RAdm. R. Whitaker, Commanding Officer, Military Sea Transportation Service, at Navy League, Newark, N.J., Dec. 1.

DEPARTMENT OF THE AIR FORCE

Brig. Gen. L. A. Kiley, Commander, Air Force Missile Development Center, Holloman AFB, N.M., at Engineers & Scientists Meeting, Tucson, Ariz., Nov. 22.

Gen. J. P. McConnell, Chief of Staff, USAF, at Houston Forum, Houston, Tex., Nov. 29.

Hon. Robert H. Charles, Asst. Secretary of the Air Force (Installations and Logistics), at American Institute of Aeronautics and Astronautics Meeting, Boston, Mass., Nov. 29-Dec. 1; at Armed Forces Management Assn. Meeting, Dayton, Ohio, Dec. 16.

Brig. Gen. J. S. Bleymaier, Commander, Air Force Western Test Range, at American Institute of Aeronautics and Astronautics Meeting, Boston, Mass., Nov. 29-Dec. 1.

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ICBM Reutilization Program To End

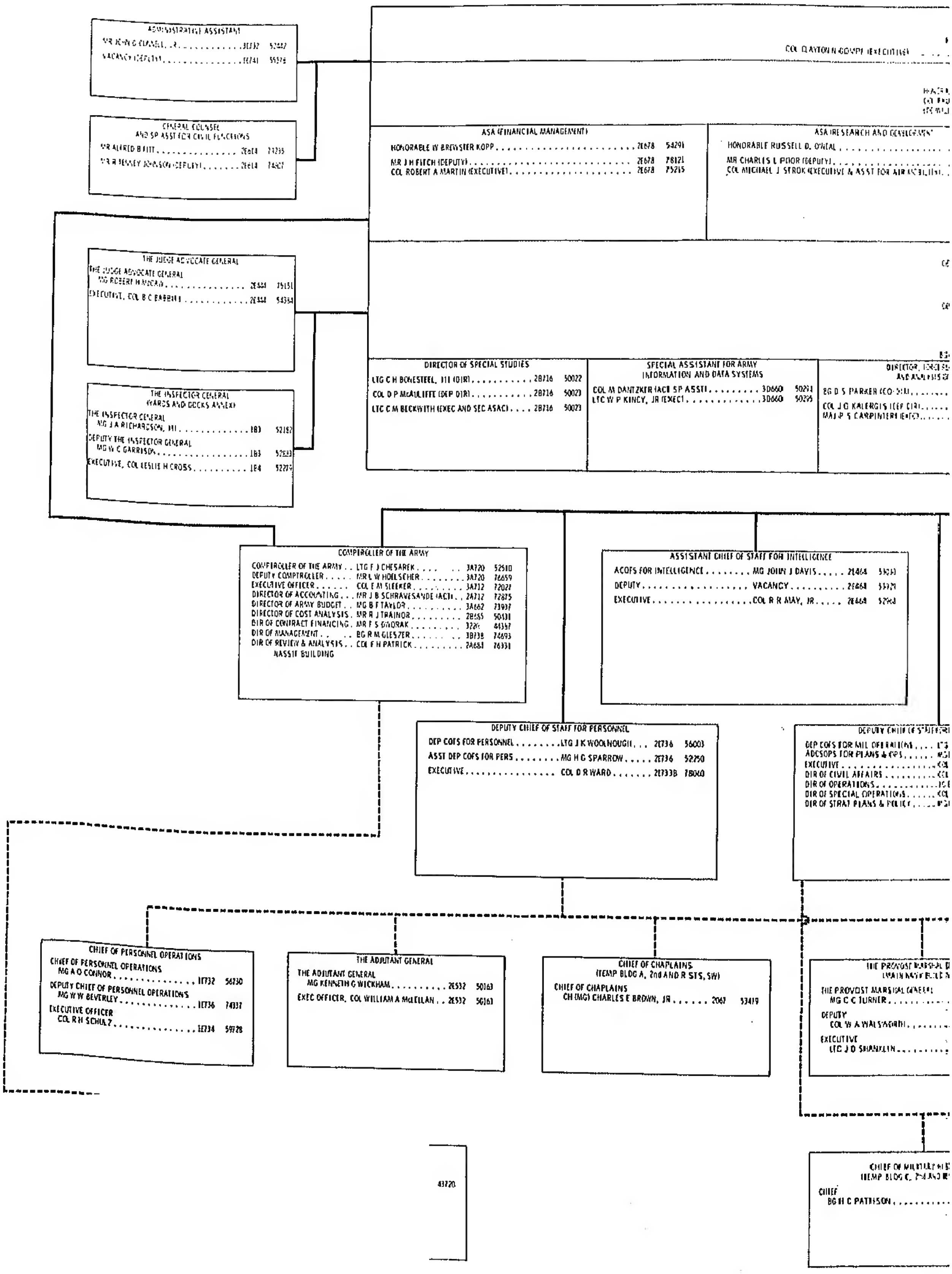
The largest disposal program undertaken by DOD since World War II, the Air Force's one-billion-dollar ICBM reutilization and disposal program, involving the deactivation and phaseout of first generation missiles, is scheduled to end soon.

The reutilization program affected 99 Atlas sites, 18 Titan I complexes, 153 launchers and 221 missiles, counting ICBM's on operational launchers, spares with operational units and missiles in storage and still at manufacturers' plants.

Re-use of missile equipment located at deactivated Atlas E and F and Titan I complexes has saved the Air Force over $900 million.

Executive management for the entire program was performed by Headquarters, Air Force Logistics Command, and the San Bernardino Air Materiel Area, Norton AFB, Calif.

HEADQUARTERS, DEPAR



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...ARY OF THE ARMY

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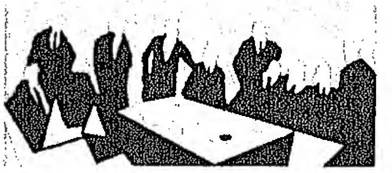

MEETINGS AND SYMPOSIA

DECEMBER

15th Annual Wire & Cable Symposium, Dec. 7–9, at Atlantic City, N.J. Sponsor: Army Electronics Command. Contact: Milton Tenzer, Electronic Parts and Materials Div., Electronics Components Laboratory, Army Electronics Command, Fort Monmouth, N.J. 07703. (Area Code 201) 535–1834.

Fourth Symposium on Unconventional Inertial Sensors, Dec. 6–7, at the Department of State Auditorium, Washington, D.C. Sponsors: Naval Air Systems/Ordnance Systems Commands; Research & Technology Div., (AFSC), and the Institute of Navigation. Contact: Capt. Ross E. Freeman, USN (Ret.), Executive Dir., Institute of Navigation, Suite 912, 711 14th St., N.W., Washington, D.C. 20005. (Area Code 202) 783–3296.

American Ordnance Assn. Symposium on the Fabrication and Utilization of Lightweight Armor, (Classified), Dec. 13–14, at the Army Tank Automotive Center, Warren, Mich. Sponsor: American Ordnance Assn. Contact: Director for Advisory Service, American Ordnance Assn., Transportation Building, Washington, D.C. 20006.

First Nuclear Criticality Safety National Topical Meeting, Dec. 13–15, at Las Vegas, Nev. Sponsors: American Nuclear Society and organizations and contractors of the Atomic Energy Commission, NASA and the Air Force. Contact: A. J. Smith, Nuclear Reactor Safety Group (WLAS–1), Air Force Weapons Laboratory, Kirtland AFB, N.M. 87117.

JANUARY

Symposium on Circuit Design by Computer, Jan. 30–31, at New York University, Bronx, N.Y. Sponsor: Office of Naval Research. Contact: Cdr. D. D. Kilpatrick, USN, Office of Naval Research, Department of the Navy, Washington, D.C. 20360. (Area Code 202), OXford 6–3082.

MARCH

Symposium on Modern Optics, seventeenth in a series of international symposia organized by Microwave Research Institute, March 28–30, at New York City. Sponsors: Air Force Office of Scientific Research, Office of Naval Research and Army Research Office. Contact: Lt. Col. E. P. Gaines Jr., (SREE), Air Force Office of Scientific Research, Tempo D, 4th and Independence Ave., S.W., Washington, D.C. 20333. (Area Code 202) OXford 6–3671.

Defense Electronic Supply Center Strives for Reliability and Economy

Engineers of the Directorate of Engineering Standardization, Defense Electronics Supply Center (DESC), Dayton, Ohio, are in the process of consolidating specifications covering parts for various weapon systems. The group, which is spearheading a drive to show that reliability can be economical, expects that the plan will ultimately save the Military Services and DESC a sizeable sum without endangering reliability standards.

Established reliability specifications cover many of the technical requirements for parts used in the Minuteman missile and the F-111 aircraft. DESC engineers, however, are meeting with military and industrial representatives to resolve differences in specification requirements so that DESC-managed specifications will become the single controlling document.

The established reliability specifications differ from the conventional specifications, calling for more stringent quality control and testing requirements which provide evidence of reliability. General specifications cover basic requirements for parts such as a fixed-film resistor. To cover the varying characteristics of film resistors such as their overall length or diameter, specification sheets are attached to describe the item.

In terms of economy for electronic parts, the consolidation of specifications and specification sheets are expected to have a major impact on the Defense pocketbook. By merging two or three sheets from several specifications into one, there would only be one part to stock instead of two or three. Logistics-wise there would only be one stock number to manage.

Also when the need for the extra specification is removed, the need to maintain the general specifications also disappears. The specification writer's job is made easier when only one specification must be revised.

The major objective of the consolidated specification effort is to increase the quantities that can be procured under one specification. According to the economic laws of procurement, larger quantities result in lower prices. Consequently, the buyer who previously purchased 200 resistors under one specification and 300 under another could obtain 500 at a reduced unit price under the consolidated concept.

Industrial sources have also indicated that the effort will have a significant impact on production operations. In-house documentation will be reduced since firms were required to keep separate process specifications and documents for each military specification. Another significant change is the reduction in the amount of testing required. Since each specification requires the same tests, the reduction of one would result in reducing the number of sample units to be tested by one-half. Consolidation of three specifications, therefore, would reduce the number of sample units by two-thirds.

DESC officials also cited the possibility of increased competition on procurements under the consolidated specifications. A contractor would not be required to qualify for the requirements of several specifications where duplicates exist. In other words, qualifying under one specification could make him eligible for bidding on several other parts.

The program is concentrating on resistors, capacitors and semi-conductors since these are more commonly used by the Military Departments and readily lend themselves to standardization. Documents for insulated fixed-film resistors are currenty undergoing coordination in the field. Two others—a solid-electrolyte fixed capacitor and another type of fixed-film resistor—are being readied for coordination. At least six specifications have been identified for review and the directorate is hopeful that the projects can be completed before the end of 1966 or early in 1967.

FROM THE SPEAKERS ROSTRUM

Address by Hon. Paul R. Ignatius, Asst. Secretary of Defense (Installations & Logistics), at the Annual Luncheon of the National Security Industrial Assn., Washington, D. C., Oct. 6, 1966.

Hon. Paul R. Ignatius

Logistical Support in Southeast Asia

I would like to discuss with you the logistical support of our military operations in Southeast Asia. Ensuring that our forces there have the resources they need to carry out their missions is the number one responsibility of the materiel secretaries and the logistics chiefs today, and it is also a principal concern of many of the companies represented here. There have been many problems as well as accomplishments, and I will touch on both. We have asked a great deal this past year from defense industry as well as our military logisticians. Both have responded in a magnificent manner. Indeed, General Victor M. Krulak, Commander of the Fleet Marine Forces, Pacific, stated after a visit to Vietnam earlier this year that the supply situation in Vietnam "is generally better in this war than in any war in the modern era."

Transportation.

First, I would like to review several highlights in the field of transportation. There is a saying in the transportation field that "nothing happens until a move is made." Transportation is the link between production and consumption—the means by which we deliver what you make to the troops who use it.

It is one thing to move supplies through a system where facilities are well established; it is quite another where facilities are virtually nonexistent. There was in South Vietnam, as late as a year ago, only one deep water port—Saigon. There were neither roads nor railroads available to us to move supplies from that port to our forces up-country. Yet in the first six months after our major deployments began, 200,000 troops were moved into the country and supplied with the thousands of items needed for combat operations and their health and welfare.

Airfields and port complexes now exist where before there were only sand dunes and rice paddies. The port of Cam Ranh Bay is a good example. There, on an undeveloped beach, we are constructing one of the largest deep water ports in Southeast Asia. Other ports have been constructed or improved all along the coast. In the last year the port capacity in South Vietnam as a whole was increased by more than 300 percent, and additional capacity is now under construction.

The importance of this increase in port capacity can be illustrated by just a few figures. In mid-year 1965, 176,000 measurement tons were being shipped by sea each month from the United States to South Vietnam. In August 1966 over 600,000 tons were shipped. One year ago, the total military cargo discharged through Vietnam ports averaged 12,500 measurement tons per day. Today the average is 40,000 measurement tons. The deep water ports now in operation at strategic points along the coastline are easing the pressure on the port of Saigon.

To meet daily consumption needs as well as to build up theatre stock levels, it has been necessary to increase our sea and airlift capability. In August 1965 the Military Sea Transportation Service operated or controlled 299 ships. This number was raised to 459 ships by August 1966. In addition to these controlled ships, space is also used on regularly scheduled commercial ships which carry less than shipload lots of military supplies. Additional ships are now being reactivated from the National Defense Reserve Fleet and will soon be in operation to provide still more capacity.

We have also increased the number of aircraft operated or controlled by the Military Airlift Command. Missions flown to South Vietnam increased from 550 in August 1965 to 900 in August 1966. During this period, tonnages shipped by air have tripled.

A logistics pipeline of this magnitude extending over a distance of some 10,000 miles involves a host of interrelated factors, all of which must be brought into play in their proper time and place. Production, transportation, handling, storage and, ultimately, receipt on the far shores for onward distribution to combat units must each be related to the other as well as to the facilities all along the pipeline. Obstructions at any point produce a chain reaction that affects the efficiency of the entire system. For example, the inability to handle cargo in the overseas ports results in holding large numbers of loaded ships awaiting discharge. This, in turn, reduces the total shipping capability and, thus, clogs the pipeline on this end. More importantly, the resulting congestion could prevent the more essential supplies from getting through.

While some problems remain, we have come a long way since November 1965 when port congestion reached a peak with 122 ships awaiting discharge in Vietnamese waters. As someone observed at the time, if nothing else these 122 ships proved that ten ports in the United States could load ships faster than one port in Vietnam could unload them. Today, with the port development that has already taken place, together with improved shipping practices, about 60 ships with military cargoes are in

Vietnam ports, which is just about normal for the tonnage involved.

The lessons of the last 12 to 15 months have emphasized the need for further research in the field of materials distribution and handling. We need to take more of a "systems" approach to the movement of materiel, identifying and properly allocating the many types of costs involved so as to make sound equipment decisions. In addition to looking at the problem from the wholesale supply level, we need to place greater emphasis on materials handling and movement in tactical units. Undoubtedly many of you here are interested in problems of this kind.

To shorten reaction time and to increase the responsiveness of logistics activities in the support of operating forces, whether it be in the form of supplies or service, remains a primary objective of the logistician. The Redball Express operation to Vietnam is a good illustration of the quick reaction concept. During World War II there was a time when the allied advance through France was threatened because the bomb-damaged railroads couldn't handle the volume of supplies moving to the front line. The response to that threat was the use of a huge fleet of trucks whose Redball markings became a symbol for the high priority, essential supplies they carried directly to the front as fast as the trucks could roll.

Today we have a new Redball Express. This time the roads are airlanes stretching from Travis AFB in California to Ton Son Nhut Airfield in Vietnam. The carriers for today's Redball Express are primarily four-engine jet aircraft traveling at 400 to 600 miles per hour.

The Redball Express keeps helicopters, tanks, LARC's, bulldozers, trucks and other major equipments off deadline and ready to go in spite of the rough and intensive use they encounter. The system is designed to deliver the required repair part to the mechanic who needs it within 168 hours (seven days) after he calls for it. Since the Redball Express was established in December 1965, more than 13 million pounds of high priority cargo have been airlifted to Saigon.

Construction.

Port development was only a part of the overall construction task that faced us in South Vietnam—a task that had to be accomplished within the constraints imposed by the extreme heat, the high humidity, the monsoon seasons, and the interdiction of the highway and railroad systems by the Viet Cong.

In addition to the 10 major ports with 25 deep water berths, the construction program includes four major logistic depots, 24 airfields of all types, brigade or equivalent contonments at 40 different locations, 12 bases for coastal patrol and river patrol activities, plus all of the other facilities required for military operations such as troop housing, messing and service, supply and maintenance, petroleum distribution, warehousing, communications, administration, hospitals, utilities, and even roads and bridges.

Programs for out-of-country support of Vietnam include airfields, logistical bases, hospitals and other support facilities throughout the Western Pacific as well as training bases and support facilities in the United States.

Before U.S. combat troops were deployed to Vietnam, one major contractor—the joint venture of Raymond International and Morrison and Knudsen (RMK)—was doing a limited amount of work in the country. In May 1965, the contractor was directed to increase his rate of work-in-place from two million dollars per month to $25 million per month. This was later increased to $40 million per month—a rate now being achieved. To meet the demands of the greatly enlarged effort, two additional firms were brought into the joint venture.

The contractor's work force was increased to some 51,000 people, including 4,200 U.S. citizens, 5,800 third country nationals (mainly Koreans and Filipinos) and 41,000 Vietnamese. To add to the difficulties, skilled laborers were in extremely short supply and training facilities were non-existent. Thus it was necessary for the contractor to import the essential hard core of needed skilled workers, and teach the rest the basic elements of a skill or trade. The skills the Vietnamese have learned as a result of the construction program will be of lasting value to the country.

In this connection, it is important to note that the struggle in Vietnam involves much more than military operations. Equally important are the comprehensive social and economic programs. These programs require significant logistics support involving a wide range of commodities and a complete distribution system. DOD works closely with the Agency for International Development (AID) in order to maintain the right balance between military and economic program priorities and to ensure the maximum utilization of the limited distribution system facilities available. As one example of this cooperation, AID cargo is now entering the military pipeline in the United States and moving under military control to its destination in Vietnam.

Material Support.

Having briefly covered the transportation system and the supporting base structure, I would now like to comment on the material which is flowing through this pipeline.

Winston Churchill's rule of thumb for wartime expansion may provide one index of the effectiveness of our logistical effort. "For the first year or so you get nothing, in the next year a trickle, in the third year a flood." In the case of Vietnam, in only a year or so we are approaching a tidal wave.

The acid test of any logistics system is the ability of our forces to take the field and engage in combat. That ability has been demonstrated in full measure in Vietnam. The performance of the Miitary Services led Charles Burke, in *Fortune Magazine*, to conclude that probably no comparable war has ever been mounted as swiftly and as efficiently.

In FY 1966 military contract awards reached a total of $38.2 billion. This is the largest military procurement program since 1952 and almost $10 billion more than in FY 1965. The increase, of course, is attributable to Vietnam, and the requirements of the war dictate the mix of procurement.

Some 15 percent of the materiel tonnage flowing to Vietnam is ammunition. The air munitions pipeline, for example, contains 120,000 tons. In addition, we have over 130,000 tons of air munitions stocked in Southeast Asia. Since June we have been producing more air munitions than we have been consuming; thus we are not only meeting current expenditures but also replenishing our stockpiles. The monthly expenditure rate, as you know, is very high,

amounting to over two and one-half times the average monthly expenditure rate of the Korean War. Should a higher expenditure rate become necessary, we are prepared to support it. The ammunition production program has required the reactivation of 10 standby Government ammunition plants and, in addition, a large segment of U.S. industry is participating.

The aircraft production program is equally significant. Production rates for the F-4 and for several of our helicopters have been sharply accelerated. Equally important has been the greatly expanded production of aircraft repair parts needed to keep the air fleets operating.

But the war demands more than munitions and aircraft. Its effect is also felt by the Defense Supply Agency (DSA) which furnishes the soft goods and common items of supply. DSA's contracts in FY 1966 totalled $4.4 billion, up $2.6 billlion from the prior year. Two interesting examples of DSA's contributions are the new lightweight combat uniform and the new tropical combat boot. Both items were originally intended only for the Army's Special Forces Units, but their characteristics were particularly well-suited to Vietnam and they are now being furnished for all of our combat forces there. Since June of last year, DSA has awarded contracts for more than five million of these uniforms, and over one million have already been shipped to Vietnam. The tropical boot has required the establishment of six production sources and the development of new molds and bonding processes. Again, over a million pairs have already been delivered to Vietnam.

The supplies and equipment needed in Vietnam involve a very large proportion of the more than three million different items stocked by the Military Services. Each of these items, in its own way, can be essential to operations at any one time or place. Stocked all over the world, in hundreds of supply points, the centralized control of these items and the assurance of their availability at the time and place needed is an extremely demanding task. Anyone who has had experience with large supply systems, in Government or in industry, knows that somewhere, sometime, some place, something will be lacking. This will occur no matter how much money is spent. It simply reflects the fact that no system involving hundreds of thousands of people and millions of items spread around the globe can ever be 100 percent perfect.

Despite the difficulties involved, our supply systems have provided what was needed. This fact has been repeatedly emphasized by our senior military commanders. General Westmoreland has stated that there have been "no shortages in supplies for the troops in Vietnam which adversely affect combat operations or the health and welfare of the command." General Wheeler, the Chairman of the Joint Chiefs of Staff, and other military leaders who have inspected our combat operations in Vietnam have come to the same conclusion.

The accomplishments of the Military Services gain added significance when the circumstances under which they have been attained are fully appreciated. We have deployed 315,000 troops to Vietnam and mounted an accelerated defense production program during a period when the U.S. economy has been operating at unparalleled levels of civilian demand and general prosperity. Yet we have met our needs without imposing the usual wartime controls.

- No mobilization has been decreed, either partial or otherwise.
- No reserves forces have been ordered to active duty.
- No significant restrictions have been placed on the civilian economy.
- No economic controls over wages, prices, profits, or materials have been imposed.

Yet all of our military commitments have been met and we hold in readiness a strong reserve force and a healthy and productive economy to meet any additional contingencies that may arise.

Clearly the logistics accomplishments of the past year could not have been achieved without the wholehearted and able support of American industry. We must continue to work productively together. It is important that we give you as much advance notice as we can of our military requirements. It is important that you meet your production schedules and hold your costs to a minimum.

Excerpt from address by Hon. Alexander H. Flax, Asst. Secretary of the Air Force (Research and Development), at American Institute of Aeronautics and Astronautics Space Simulation Conference, Houston, Tex., Sept. 8, 1966.

Hon. Alexander H. Flax

Space Technology Comes of Age

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. . . the high vacuum technology which was in the first instance the source of much of the initial knowledge for space simulation has now begun to benefit from some of the technical advances made in the development of space simulators. Similarly, in the field of aerodynamic decelerators, parachute development for high speed military aircraft use in the period during and after World War II provided the basis for space capsule recovery both manned and unmanned; continuing development of parachute space capsule recovery systems, in turn, provides a significant source of new ideas on parachutes which must operate under high shock or higher speed conditions.

It is this interdependence of various fields which characterizes the social environment of modern science and technology and is, I believe, the correct interpretation of what some have sought to describe in terms of technological fallout theory.

It would be absurd to argue that, if better high vacuums are needed for thin film deposition, we should concentrate research and development work on better space chambers or that, if we need controllable parachutes for improved tactical airdrop,

we should concentrate more effort on parachute-guided maneuverable re-entry vehicles.

Nevertheless, it can be argued that, if two complementary efforts with quite different objectives in high vacuum systems or in parachute decelerators exist, the total output of these efforts may well be greater than the sum of the parts.

Thus space technology may be said to have come of age in a purely technical sense. It is now a full partner with other technical fields lying on the frontiers of the technical application of knowledge. Such fields are characterized not by a static, unchanging body of knowledge, concepts and techniques, but a dynamic interaction between new scientific and technical and the economic, social, military, or political factors affecting applications. Of course, almost any area of technical application, no matter how mature, is susceptible to upset by a new discovery. Witness, for example, the relatively old and stable art of shipbuilding in which roll stabilizing venes and, more recently, the "bulbous nose" have proven to be significant innovations as evidenced by widespread application. In the technical fields near the frontiers of the application of knowledge, the occurrence of much innovations is more frequent and their nature more radical.

But there are other and more dramatic evidences that space technology has come of age. Here at Houston we cannot better begin an enumeration of such evidence than by citing the steady measured pace of accomplishment in the Gemini Program. It would not be proper to describe the achievements in this program as routine since almost every flight introduced some new and previously untried element of manned space operating capability; yet the discrete operations from launch to recovery have come to be performed with such predictability that there is a strong temptation to regard some of them as almost routine.

The two major large vehicle development programs which we in this country have been pursuing and which are presently in flight status have achieved a degree of success, even in early development launches, which would have been considered only remotely believable had it been offered as a prediction five years ago.

The evident reliability which has been designed and built into these vehicles has been accompanied by a decrease in the unit cost per payload pound launched into low orbit to figures on the order of $500.

The reliability of space launch vehicles is a significant factor to the user and will remain so no matter what the reduction in the costs of launch vehicles may eventually be, as long as payload costs remain high, but cost is not the only factor here. Failure to launch at the prescribed time can be a major detriment in certain types of missions. In the period when the reliability of space launch vehicles was unacceptably low, there were many hypotheses as to what approaches might be used to improve the launch vehicle reliability. Among these were:

- Particularly simple designs with minimum mechanical and electronic complexities were to be preferred.
- Repetitive experience with specific hardware was necessary.
- Rigorous discipline to limit even minor changes had to be exercised.

There is no doubt even today that all of these factors have a bearing on the reliability of launch vehicles. However, the application of rigorous engineering disciplines in design, manufacture, qualification testing and, more important than any of these, launch procedures has proved to be single factors.

It probably remains true that the cost of applying these rigorous procedures can be minimized by adherence to some of the precepts which had been advanced earlier, but it is now clear that even entirely new vehicles can be made to achieve a high degree of reliability early in their test program as long as the maximum advantage is taken of experience both in the hardware and in an engineering sense.

Up to this time, almost all of the DOD and NASA missions in the payload category above 200 pounds have been launched with vehicles which drew heavily on the technical and operational maturity of hardware derived from the ballistic missile program, principally Thor, Atlas and Titan. In the near future, entirely new rocket motors and launch vehicles, particularly those under development for the NASA Luner Landing Program, will alter this situation.

Also, on the DOD side, the Titan IIIC solid motors represented a development "ab initio" although the technology for such motors depended in major degree on Polaris and Minuteman antecedents. However, up to this point, our national launch vehicle program has had an "erector set" or building block character. Elements of the Thor, Atlas and Titan have been mated with the Agena stage and other upper stages and, in the case of the Thor and Titan, augmented with strap-on lower stages. These vehicles, such as Thor, Thor-Delta, Thrust-Augmented Thor, Atlas-Agena, have demonstrated reliabilities (expressed at the ratio of successful launches to total launches) of 90 per cent or greater during the past year.

The use of building blocks has, therefore, already been demonstrated to be capable of furnishing a highly versatile, effective and reliable family of launch vehicles in spite of the conceptual and philosophical arguments which are sometimes advanced against this approach primarily on the ground that it precludes the optimization of particular launch vehicles for particular missions.

For economic reasons, as well as the sound engineering reasons mentioned before, the building block concept in launch vehicles is undoubtedly here to stay, but it is safe to say that the building block inventory will gradually expand over the next several years as the Saturn I-B and Saturn I stages reach maturity.

The success of space systems performing operational tasks of military or civilian value is also noteworthy. The civilian and military communications satellites, the meteorological satellite program, the Vela nuclear test ban monitoring satellites, and the Transit navigation satellites are significant examples of what has been accomplished.

At least some of these systems compete with earthbound systems which can perform similar tasks, and the progress and visibility of these systems can be measured by dollars and cents comparisons with their earthbound competitors. That the outlook for those systems is bright is indeed a good indication that space technology has come of age.

The series of unmanned satellites for exploration of the solar system, Ranger, Surveyor, Lunar Orbiter, have also reached a stage of performance which illustrates how much progress has been made in space tech-

nology. The essence of what has been demonstrated is that, by adequate engineering and planning, monitoring of the fabrication and assembly, and qualification and functional testing in realistic environments, it is possible to attain a high probability of success initially, and that this is the efficient and economic way to conduct such programs.

The main function of technical and program management is to relate what is technically achievable to the resource allocations, schedules and costs. While this is being done, there is often great impatience about the delay in initiating full blown development programs, but the experiences of the last ten years have clearly shown that starting a program hastily on an open-ended basis is not, in general, the short route to success.

In all of what has been said, I have attempted to interrelate those things which mark a competent and effective technology; the capability to plan and execute projects which involve the application of scientific and engineering knowledge to a specific practical objective with the minimum expenditure of resources which will accomplish the desired result. The degree to which programs can be planned and executed with regard to the minimum expenditure of resources depends, of course, on good management. It also depends on being able to assess from experience and by a judicious combination of analysis, simulation and tests, just what resources can be expected to produce given technical results; and to assess within rather narrow limits what confidence can be attached to such estimates. This is the mark of a technology which can be said to have come of age, and it is this mark which space technology has now reached as a result of technical progress and both technical and management experience in a wide variety of programs.

I believe that emphasis on accomplishment with minimum expenditure of resources will be increasingly important in the future since it will determine in considerable measure both the scope and the rate of progress of our space effort.

The reasons for this are clear. Where space systems compete with earth-bound systems, as is particularly true in progress aimed at scientific investigations and the exploration of space, the total amount which can be done is necessarily limited. I would like to clarify this last statement because it is so easily misunderstood.

The advance of space technology which we have witnessed in the past ten years is typical of a situation which has occurred in many other fields of scientific and technical research and development. Science and technology now offer us not only many alternative ways of performing many new tasks, potentially useful in either military or civilian applications. It would be neither possible nor practicable to proceed on the full scale development of all systems which the technology makes possible.

As you know, the Federal budget for research and development test and evaluation has experienced a steady and phenomenal growth over the past 25 years. Even expressed in percent of a growing gross national product, the Research, Development, Test and Evaluation (RDT&E) budget has gone from seven-tenths percent in 1941 to almost three percent in 1965. Most recently, we have been through a period of highly accelerated growth, in which the initiation of a massive space program added to a rising curve of cost for development and acquisition of ballistic missiles, resulted in RDT&E growth rates in the neighborhood of 20 percent per year.

Some people have tended to think of this maximum achieved growth rate as now ordained to be the natural order of things and destined to continue indefinitely. This trend, if it were to continue from the level of 1964 for ten years, would result in a Federal RDT&E budget in excess of the total budget of today by that time. The need to make selections from among many technical possibilities and to control the cost of our research and development activities should not be regarded as a problem. The situation bespeaks a very healthy scientific and technical posture for the nation. Further, the fact that science and technology now offer us many more things to do than we can possibly afford is hardly to be interpreted as meaning that progress and growth is at an end or on a plateau; it does, however, point up the need for selectivity and a situation in which progress offering small benefit at high cost will not survive.

The problem of making selections in research and development is, of course, to some degree a matter of speculation; the speculation relates not merely to the probability of achieving success but also to achieving that success at a reasonable cost in relation to the benefits to be obtained. Because we are now in many cases faced with programs whose estimated cost is of the order of one billion dollars, decisions and commitments cannot be made lightly.

I have had officers and civilians who were concerned with aircraft development at Wright Field in the 1930's point out to me that, as majors or civilian P4's, they were making without review decisions of the kind which now go up to the highest echelons of the Air Force and DOD.

I am compelled to point out to them that in 1937 the Army Air Corps research and development budget was five million dollars and that, even allowing for the differences of bookkeeping and converting to equivalent 1965 dollars, they were making rather small commitments of national resources. Further, at the then prevailing cost levels, we could afford to pursue several alternatives in parallel so that no one program decision had as much impact as many of those we must make today.

The need to make hard choices in the research and development program is, of course, perhaps the key problem in overall program management and we do seek all the assistance we can get from people inside and outside the Government in assessing both the potentials and risks of various proposed programs. One commonly used aid to management is the advisory committee, and we in the Air Force are most appreciative of the time and energy which many eminent and already overworked people put into their efforts in advising us. We also derive great benefits from the advice they give us.

Nevertheless, advisory committees rarely can put their findings into an overall R&D program context—they can indicate whether a given line of technical effort in a specific field is promising and make suggestions as to how specific programs should be planned and scheduled. This sort of report is extremely valuable and, in some areas, we could hardly proceed without such an evaluation, but generally it does not in itself provide a

sufficient basis for a decision to proceed with any program.

The situation was epitomized in Warren Weaver's essay, "The Report of the Special Committee." As many of you will recall, that standard report essentially concluded with five points: The scientific field, X, is of critical importance and it is essential that we deepen our knowledge in this area; the field X has been meagerly supported in the past and there is every reason to believe that modest but substantial support (say 20 times the present level) could promptly lead to results of the highest significance. And so it goes on to the fifth conclusion which is that, although the committee deplores international rivalry in science, it feels compelled to point out that the Russians appear to be ahead of us in field X. This applies to any subject—geography or oceanography or arctic exploration or space—it really doesn't matter, you fill in the subject. I am sure you have seen many such reports.

In summary then, space technology has arrived at a point in its maturation where it is now possible to plan and execute a wide variety of program options with a reasonable degree of confidence as to attainment, schedule and cost. We must, however, increasingly turn our attention, as in other fields of engineering, to the economics of our programs; this, lest it surprise anyone, is a normal function of the engineer.

Sometimes it has been forgotten that advancements in technology can be used to reduce the cost of a program as well or better than it can be used to eke out the last iota of vehicle performance. With the basic space technology which we now have in hand, and its continuing growth based on specific program experience and the very considerable national effort in research, exploratory and advanced development which feeds the technology, we have the technical means for defining and achieving our

Address by Capt. J. L. Howard, SC, USN, Dir. of Procurement, Office of the Asst. Secretary of the Navy (Installations & Logistics), at the National Aeronautics and Space Administration Logistics Management Symposium, Huntsville, Ala., Sept. 13–14, 1966.

Capt. J. L. Howard, SC, USN

Contracting for Logistic Support

In contemplating the subject of contracting for logistic support, it is appropriate at the outset to look at a bit of history, review present trends in contracting in general, and put the support question in perspective.

History.

Throughout the 19th Century, the Army and Navy relied very heavily on Government-owned manufacturing facilities for the production of its heavy weapon systems. The Navy had its shipyards and ordnance plants. The Army had its arsenals and ordnance depots.

The 20th Century brought the airplane, and the airplane, in its turn, brought some new approaches to the production of major systems.

Without going into the details of basic national policy decisions which were made in the 1920's, suffice to say that the idea of Government reliance on private enterprise for the production of aircraft became well established between World War I and World War II.

reliance matured, grew
ied, we saw also the leaps
in technological progress
with the 1940's and 1950's.

We are now in an era of technological complexity that involves the convergence of many divergent disciplines in the production of operating hardware. Electronic sciences now have interfaces with powerplant disciplines. These, in turn, have bearings on the human sciences, and we see the need for concurrent efforts and trade-offs between the various possibilities and limitations in chemistry, metallurgy, biology and hosts of other lines of scientific and engineering endeavor.

Present Trends.

The trends that began in the 1920's, i.e., reliance on industry and the growing complexity of technology, are continuing today.

In the field of Government contracting, the trends are keeping pace, both in complexity and in seeking to strengthen the economic basis on which the United States has become prosperous and powerful.

Specifically, the trend in DOD procurement policy is to stimulate competition among private industrial complexes, and to shift the burdens of risk to the private sector of the economy.

More specifically, the Navy today has an expressed policy, issued by Secretary Nitze, that seeks not only to intensify competitive effort among Navy suppliers but, equally important, to assure that the benefits or competition be kept inviolate through a policy of "hands off" during the contractor's performance of the contract.

Along with this expressed policy is the move toward more specific determination of the performance, quality and reliability we want in our hardware, and less dependence on detailed blueprints, drawings and design specifications.

Compare, for example, the Navy's traditional approach to ordnance production and shipbuilding. In these areas we have for decades been the recognized experts. We could conceive, create, design, develop and build naval guns and ships. We had, and still have, a womb-to-tomb capability, including a capability for support.

We have never had this in the same degree in aeronautics. We have acknowledged experts in aircraft and powerplant design. But generally, we have for years relied very heavily on the initiative, impetus and imagination of industry.

In aeronautics we have stated, in terms of performance, quality and reliability, what we want the airplane to do, where it is to fit in a carrier configuration, and how it should operate at sea. But we have left most of the graphic details to industry.

We are beginning to apply that philosophy in other fields as well. The Fast Deployment Logistics Ship (FDL) project is a case in point. The same is true in certain missiles, torpedoes and communications equipments.

We are saying, in effect, that we will specify to industry what we want the system to do, and it is our intention to draw on industry's imagination and profit motive to do the rest.

There are a number of illustrations of these trends in action. We are driving hard to reduce the use of Cost-Plus-Fixed-Fee (CPFF) contracts and shift to incentive types and fixed prices. Those place the burdens of economic risk on the contractors.

We are using weighted guidelines which have specific factors for company contribution, company risk, etc.

We are moving in the direction of total procurement in which the Air Force has been a pioneer.

Perspective.

Now, to put these things in perspective, it is important to look at this question of risk.

The risk to a contractor in a fixed-price contract, or in incentive-type contracts—cost or fixed price—is clear. It is primarily a matter of economic risk. The survival of the company is at stake if it overruns its costs to such an extent that it folds.

There are risks to the Government as well. The risk, from the Government's standpoint, is in failing to get either what it wanted or when it needed the item. This is particularly critical in the military fields.

This means, therefore, that the contract must be a finely balanced instrument that contains the right amount of risk for the company, and the right amount of incentive reward, to give the company the necessary motivation to succeed in performing the contract. We do not want to drive any company out of business. That is not in our interest whatsoever. This is why, from our standpoint, the penalties for degrees of shortfall must be reasonable.

On the other hand, the penalties for shortfall must be stringent enough to hurt. And the incentives for success must be worth the effort to gain the rewards.

While we consider these factors, however, the Government must also have a contract that gives it reasonable confidence that the right quality will be delivered on time at reasonable cost.

The achievement of such delicately balanced contractual instruments is most difficult. In reviewing most of the contracts we have today, one might question whether we have yet achieved the perfect balance desired.

Now, the perspective required here is that we have been discussing the problem of development and production. Following these things is the problem of support—continuing support.

Clearly, in the area of major weapon systems, we are always in a state of calculated risk. We assess the threats at sea, in the air, below the sea, in space and on land. We determine what we need to meet those threats. And we designate the time frame within which, or the time by which, we need the capability required.

If we do not make it, the threat is magnified. Think back to Sputnik and remember the pressures we were all under in those months following that turn of events.

Now, when we do, in fact, have a hardware capability in the hands of the men who must use them, and we have the trained men, the vehicles, and all it takes to operate the weapon systems, the question of support becomes absolutely critical.

Awesome though it is to contemplate that a hardware capability might not be at hand when we need it, it is equally critical that we have assured and continuing support for those weapons that are at hand.

The Problem.

The problem in the area of support, therefore, is in getting absolutely certain support. There can be no if's or but's about it. We must.

The problem is to structure contracts so carefully as to provide airtight response. If we do not get the material we need in support, we can lose skirmishes, battles and wars. We can penalize the contractor under the contract, but this would be small penalty compared with being loser in war.

In the Services, of course, we meet this problem by building up our own in-house capabilities for supply and maintenance support, complete with overhaul depots, repair facilities, supply installations, stock levels of supplies and war reserves.

Of course, we do, in fact, rely on commercial suppliers for a lot of these things, too. We send many equipments back to commercial plants for rework, overhaul and modification. We use basic ordering agreements and indefinite quantity contracts for parts support in the expectation that the moment we order something it will be forthcoming immediately.

But generally, the theory has been that operational support must be a matter of command, not contract. This is why we have depots and overhaul shops as organic parts of the Military Services.

This does not mean, however, that we cannot rely on industry for support. On the contrary, we can and do. And, as we have seen in major end-item production, the trend is definitely toward more of the same in the support area.

We are using contractors more and more these days to man our missile ranges and advance bases.

We are using contractors for certain support services, e.g., data collection and processing services.

We use contractors, as indicated, for overhaul, for on-the-spot supply, etc.

But the problem remains one of structuring contracts so carefully as to provide assured support, on time, at reasonable cost.

With the shift from CPFF contracting, the demand upon us for finely structured contracts is greater than ever before. We shift the economic risks to our contractors, but we assume a greater response risk on the Government's side because the higher order contracts carry the strong implication of hands off.

We cannot, for example, pump in more money just to give the contractor more people and facilities to make him more responsive. These actions are not in keeping with the purpose of incentive and fixed-price contracts.

We are, nevertheless, moving gradually to greater reliance on contractors in certain of these support areas. The total package concept is one example. The newly evolved concepts

(Continued on page 41)

High Level Study Group Reviews Expansion of Industrial College Program

The Commandant of the Industrial College of the Armed Forces (ICAF), capstone of the military educational system in the management of national security resources, has been directed by the Joint Chiefs of Staff to review the desirability of broadening ICAF participation in management education and related activities within DOD.

Lieutenant General August Schomburg, USA, who has served as Commandant of the Industrial College since April 1964, will head the study group. He will be assisted by Major General Jerry D. Page, Commandant, Air War College, Maxwell AFB, Ala.; Major General Eugene A. Salet, Commandant, Army War College, Carlisle Barracks, Pa.; and Rear Admiral Frederick H. Schneider, Jr., Chief of Staff, U. S. Naval War College, Newport, R.I.

Objective of the study is to determine whether or not it is feasible and desirable for the Industrial College to assume functions in management education and training that extend beyond its current mission. The college is also directed by the Joint Chiefs to consider alternate methods. The study pertains to administrative management of resources, as distinguished from military management of combat forces. Findings are to be reported by the end of the year.

Areas being studied include research and dissemination of information on the latest developments in management practices; seminars to be conducted at local levels to improve communications with mid- and top management; and a highly professional and scholarly journal which would serve to encourage original contributions and provide a mechanism for improving communications concerning management.

The project has been named the Management Education and Training (MET) Study.

Colonel Peter P. Dawson, USAF, director of the college's Office of Academic Plans and Research, is in charge of planning and research phases of the study.

A working group of some 16 members will assist in the study. Planning, research and administrative aspects are being handled by Industrial College staff and faculty members, augmented by representatives of the Army, Navy, Air Force and Marine Corps assigned to the college on temporary duty.

Powerful Continuous-Beam Gas Laser at Work in USAF Lab

A continuous-beam gas laser which produces an invisible infrared beam from electromagnetically-stimulated carbon dioxide, powerful enough to burn through a high-grade firebrick in five seconds, is now in operation at the Air Force Weapons Laboratory, Kirtland AFB, N.M.

Said to be the most powerful continuous-beam laser in the world, the laboratory's Effects Branch is using the 500-watt infrared output to study interactions of the laser beam with various materials. The laser has proven an excellent device for focusing controlled amounts of energy upon target materials.

As is characteristic of lasers, there is no heat in the beam of light projected. The heat is generated in the target material as the light is absorbed.

The device consists basically of a double-walled glass tube 44 feet long. The inner portion of the tube is filled with a mixture of carbon dioxide, nitrogen and helium. The outer section is filled with water which circulates constantly through a heat exchanger, cooling the laser tube.

When operating, the gas mixture is fed constantly into the system, with the used gas passing through an exhaust system into the air outside the building. This eliminates any possible carbon monoxide hazard.

At one end of the tube is a gold-plated mirror which reflects light back into the gas mixture. As the laser action takes place, the beam is emitted through a window made of salt in the opposite end of the tube.

The salt window, a single sodium chloride crystal two and one-half inches in diameter, absorbs none of the energy of the beam, and reflects about eight percent of the energy back into the tube to keep the lasing action in progress. Target material is placed in a carefully shielded area near the salt window.

The salt crystal is a limiting factor in the amount of time the laser can be operated at full power, for it requires replacing after about two hours of continuous use. Also, like common table salt, the crystal absorbs moisture from the air. This moisture eventually causes the crystal to turn cloudy, again necessitating its replacement.

Army Engineers Award Contract To Study Reactor Concept

A feasibility study of the Terrestrial Unattended Reactor Power System (TURPS), an advanced mobile nuclear reactor concept designed to fill a large number of electric power requirements of the Armed Forces, will be conducted by the Martin-Marietta Corp., Nuclear Division, under a contract from the U.S. Army Corps of Engineers.

Work under the nine-month, $286,898 contract will be directed by the newly formed Research and Technology Department of the Nuclear Power Field Office (NPFO), a Corp of Engineers' agency at Fort Belvoir, Va.

The study follows a conceptual design by the Martin Co. for the U.S. Air Force of a 100-kilowatt, direct conversion reactor power system that would operate unattended without refueling for five years.

Proposed as a power source for remote installations such as radar sites around the world, the majority of which are powered by diesel generators requiring frequent servicing, the TURPS power plant employs a new development in the state of the art of nuclear reactor control which eliminates the need for mechanically operated control rods. Control of the reactor is accomplished solely through the migration of hydrogen into and out of the fuel element from a reservoir at the bottom of the fuel element.

The extremely mobile unit can be disassembled into two parts and easily shipped by conventional cargo aircraft or trailer truck. The plant is designed for field installation using standard military equipment, and is capable of being placed in operation in about seven hours.

Navy Accepts A-7A Corsair II

The U.S. Navy formally accepted the A–7A Corsair II light attack bomber during ceremonies at Cecil Field, Fla., on Oct. 14. The first two A–7A's were accepted by the Commander, Naval Air Force, U.S. Atlantic Fleet, and will be incorporated into Fighter Squadron 174 for training at Cecil Field.

Delivery of the Corsair II, an aircraft especially designed to carry out the attack and close support role, came only 18 months after the aircraft's initial flight on Sept. 27, 1965.

The Navy will conduct A–7A carrier suitability tests at sea during November and December 1966 and is proceeding with on-schedule fleet deliveries.

The A–7A is produced by Ling-Temco-Vought, Inc., Dallas, Tex.

Getting Formal Advertising Over the Hurdles

By
Milton E. Jones

Fortunately or unfortunately, we are all creatures of habit, but habits can be broken by open minds. Judge Wyzanski put it quite concisely when he said, "One of the dangers of extraordinary experience is that those who have it may fall into the grooves created by their own expertness. They refuse to believe the hurdles, which they have learned from experience are insurmountable, can in fact be overcome by fresh, independent minds."

Because of wars and national emergencies, negotiation of defense contracts became a habit.

During the first World War, negotiated cost-plus-a-percentage-of-cost contracts were popular, especially with contractors.

During World War II and subsequently, the negotiated cost-plus-a-fixed-fee (CPFF) type of contract was popular. At least, this method of procurement limited the fee but it did not preclude the incurrence of costs which under more advanced types of contracts would have been avoided. In some instances, cost-type contracts have facilitated corporate expansion largely at Government expense.

Prior to the Korean Conflict, the Armed Services Procurement Act, Public Law 413, was passed. Its implementation began in 1948. This law was and is a good law. It was conceived by some of the most dedicated and knowledgeable people in the Congress and in the Armed Services. Its fundamentals are based upon decades of experience. It is a law which recognizes the facts of procurement life in the Armed Services. Although Public Law 413 states that ". . . All purchases and contracts for supplies and services shall be made by advertising, . . ." it authorizes exceptions which give the most practicable flexibility to the negotiation of contracts under stated or justified circumstances. The Armed Services could hardly have asked for a law with greater flexibility. It is interesting to note that, although minor revisions have been made to the law, its basic concepts remain unchanged.

Before a great deal of precedent had been set in the implementation of the Armed Services Procurement Act, our nation was faced with the Korean Conflict. President Truman declared a National Emergency in December 1950 and, as a result, exception (1) of the Act was invoked. This exception authorized negotiation if ". . . determined to be necessary in the public interest during the period of a National Emergency declared by the President or by the Congress." For approximately the next five years, negotiation was the order of the day. In most major procurement organizations, formally advertised procurement became a lost art. During the early part of the Korean Conflict, our primary goal was to place orders and fill the capacity of those companies capable of meeting urgent requirements. Pricing was important but was appropriately secondary. Reliance was placed, to a large extent, upon CPFF contracts, or upon negotiated redeterminable price type contracts as a means of permitting a "second look" in an effort to avoid exorbitant profits. Advertised procurement was considered much too inflexible and time consuming during this period.

Milton E. Jones, Dep. Dir of the Procurement Div., Naval Material Command, is responsible for the determination of procurement policies and methods followed throughout the Navy. He has been actively associated with Government procurement operations and related functions since 1935.

As the Korean situation stabilized, there was a recognition of the need for laying plans to return to a more normal peacetime procurement atmosphere. In 1955, the Navy on its own began the justification of negotiation on a case-by-case basis and discontinued the general use of the blanket emergency exception. Some operating personnel opposed this action as additional effort which was both unnecessary and nonproductive. The convenient use of blanket negotiation under the emergency exception had become a habit. Nevertheless, in 1956, the use of blanket negotiation under exception (1) of the Armed Services Procurement Act was effectively discontinued throughout DOD. It became necessary to justify negotiation on a case-by-case basis in accordance with the applicable exception to the use of formal advertising. Although there was some reemphasis on the use of formal advertising, major emphasis was placed upon precise justification of authority to negotiate under the various exceptions of the law. Negotiation was still a habit.

Beginning in 1961, the Pentagon took a new look at defense procurement methods. Steps were taken progressively to increase competitive procurement, promote the use of fixed price and incentive contracts, reduce the use of CPFF contracts to a minimum, avoid the use of letter contracts to the extent practicable, and increase the use of formal advertising. Although the pattern was not always clear, it was made patently evident by DOD management that "business as usual" was no longer acceptable.

In 1962, Public Law 87-653 (the "Truth in Negotiation" law) amended Subsection 2304(a) of Title 10 of the U. S. Code to read as follows: ". . . Purchases of and contracts for property or services covered by this Chapter shall be made by formal advertising in all cases in which the use of such method is feasible and practicable under the existing conditions and circumstances." This revision was implemented in the Armed Services Procurement Regulation (ASPR) in such a manner as to make it clear that, even though technically

a particular procurement came within the meaning of a specific negotiation exception, formal advertising would be required if it were feasible and practicable under the circumstances. The law and the regulation clarified the position of the Congress and gave renewed emphasis to procurement by formal advertising. Revitalization of formal advertising procedures was in progress.

One of the great stumbling blocks to the increased use of formal advertising has been the complex technical nature of defense material and equipment and the lack of an adequate data package, which would indicate precisely what was required.

During hearings in early 1957 before the Subcommittee for Special Investigations, House Committee on Armed Services, the subcommittee suggested that the Armed Forces accomplish certain procurements in two parts. The first part would solicit and evaluate technical proposals without reference to pricing, and the second part would solicit sealed bids under normal advertising procedures from only those firms having acceptable technical proposals.

At the conclusion of the hearing, the Air Force agreed to test this procedure within the Air Materiel Command for a period of six months. At the end of these tests, the Air Force reported back to the committee that the use of the two-step procedure, now known as Two-Step Formal Advertising, had its drawbacks, but that the Air Force considered its initial tests warranted further use of the technique.

In November 1958, the Chief of Naval Material authorized the Bureau of Aeronautics to conduct trial procurements utilizing the two-phase formal advertising procedure. In July 1959, after completion of its test, the Bureau of Aeronautics recommended adoption of the two-step formally advertised procedure.

Original ASPR coverage was achieved in the summer of 1960.

pected availability of adequate competition both in the technical evaluation phase and in the pricing phase. Adequate competition may exist in any instance where there is more than one potential source. On the other hand, the existence of several sources may not of itself assure adequate competition. Reasonable judgment must be exercised, based upon the circumstances of each given case.

Advertised procurement, two-step or otherwise, has been associated with items which are not of great complexity. However, the Navy procured its requirement for Talos missiles on a two-step, multi-year formally advertised basis. This missile is indeed complex and for more than ten years had been procured from a sole source. Initially, there was substantial difference of opinion in the Navy as to the propriety of using the two-step formally advertised procedure. It was only after the project manager had heard all sides that he decided to use the two-step approach. This particular project manager accepted the fact that cost analysis and detailed negotiation of price were not essential and that his requirement could be satisfied effectively by two-step formal advertising. He was convinced that this procedure was feasible and practicable. The award for the multi-year procurement was made at a unit price of approximately 58 percent of the previously negotiated unit price.

The Navy considers this procurement to be a fine example of the practicability, feasibility and economy of using two-step formal advertising on a multi-year basis to procure a complex and technical item.

Let us now touch upon another area where formal advertising is being expanded effectively. This area involves life cycle costing which is being given considerable emphasis throughout DOD. Because of the difficulty in establishing criteria and the basis for evaluating these criteria, it may appear on the surface that the only feasible and practicable method

tising and multi-year procurement, is indeed a feasible and practicable method of forcing the establishment of precise and understandable criteria and of assuring positive and uniform methods of evaluation. Of course, the same benefits accrue in this type of procurement as accrue in similar negotiated procurements with respect to increased competition generated by larger quantities produced over an extended period of time and greater standardization achieved by continuous production by the same source.

Life cycle costing is designed to give maximum value for dollars spent. The number of guaranteed service hours, mean time between failures, operability, maintainability and reliability are all significant aspects of the total cost of an item during its useful life. Also, the introduction of a new item into the supply system adds to the problems of supply, inventory, operations, maintenance and training, all of which should be taken into consideration in evaluating the net cost to the Government.

As an example, the Navy had procured for itself and the Air Force a sizeable quantity of 30 KVA Generator Systems and was preparing to make a further procurement to meet additional requirements. It was decided that competition would be obtained for the additional requirements and that factors of supply, maintenance and reliability would be taken into consideration and evaluated in determining the lowest net cost to the Government.

Two-step formal advertising on a multi-year basis, plus evaluated net cost to the Government, was chosen as the proper and most effective method of procurement.

Although the following is not a precise comparison, because of differing quantities and delivery schedules, it will give a fair idea of the results which were obtained.

The initial purchase of the 30 KVA Generator Systems was made during FY 1965 under a two-step, multi-year formally advertised procurement. Two companies submitted technical proposals and bid on the second step. Award was made for a single year to the low bidder at a price of $1,775.12 for the Navy generator and $1,792.82 for the Air Force version. A single year award was made because prices quoted on

the multi-year basis were higher than on a single year basis.

Later in the same year, the second procurement of the 30 KVA Generator Systems, which is the case in point, was processed, as previously indicated, on a two-step, multi-year, evaluated-net-cost-to-the-Government basis. Technical proposals and bids were received from the same two companies which had submitted bids on the original procurement. Award on the multi-year (5 years—1966–1970) was most economical. Company A (the current producer) bid a unit price of $1,403.95 for the Navy version and $1,420.45 for the Air Force version. Company B bid a unit price of $1,683.00 for both. Considering the factors to be evaluated—cost of preventative maintenance, overhaul costs, spare and repair parts, price of support equipment and transportation—Company A's total bid price was $4,154,237.84 and Company B, $4,963,267.82. Thus, Company A was low on both an unevaluated and evaluated basis. In this rather complex advertised procurement, technical and evaluation factors were ironed out in the first step so that, as designed, the second step was merely a pricing action. Although in days gone by, it is quite likely that the 30 KVA's would have been negotiated, by careful planning, sensible communication and precise preparation and understanding of the Invitation for Bid, formal advertising was "feasible and practicable."

It is also interesting to note that substantial procurements of warships are being made through the use of straight-formal advertising. During FY 1965, 22 destroyer escorts, nuclear-powered attack submarines, three guided missile destroyers and 22 various other smaller craft were procured by formal advertising.

From these examples, it is obvious that the use of formal advertising need not be restricted to standard, off-the-shelf, commercial-type items and that, when formal advertising is used in accordance with the two-step, multi-year and life cycle costing procedures, it can become a very useful tool in the procurement of some very complex defense items.

It is important to note that it is usually less time consuming to solicit technical proposals under the two-step procedure, evaluate these proposals, solicit bids and make an award than it is to justify negotiation, solicit quotations, evaluate proposals, obtain cost breakdowns, perform audits, negotiate an acceptable contract which requires substantial review prior to award and, finally, make the award.

We are all concerned with contractor's responsibility and there are certainly those who feel it is much easier to award to a responsible source through negotiation rather than by formal advertising. With respect to this "feeling" Secretary McNamara, over two years ago, had this to say:

> ". . . Full understanding of the importance of affirmatively determining that the prospective contractor is responsible should assist our efforts to increase the use of formally advertised procurement. Use of negotiation is never justified by a fear that advertising may lead to award to a contractor who is unlikely to perform satisfactorily. The standards of responsibility for contractors are precisely the same for advertised as for negotiated procurements. If a company would be rejected as not responsible, notwithstanding a low offer in a negotiated procurement, the same company should be rejected notwithstanding a low bid on an equivalent advertised procurement. The contracting officer has the same right and duty to determine nonresponsibility in one case as in the other."

Determining responsibility of a source is not a matter related to the method of procurement but is a matter related to facts and intestinal fortitude.

In an effort to develop a full range of contracting ability, bring technical and procurement personnel under the same command authority and, in so doing, to increase the use of formal advertising, the Commander of the Naval Material Command has directed the commanders of the Naval systems commands to be completely responsible for those technical procurements which are under the control of each respective command and which can be handled through the formal advertising procedure. Certainly, closer proximity and greater familiarity with formal advertising procedures should contribute to a substantial increase in their use.

Familiarity with formal advertising procedures and the wealth of General Accounting Office decisions which have resulted from its use should be an objective of industry as well as Government. Too frequently, industry is not responsive because of minor deficiencies and exceptions which could and would be avoided if the procedure was more comprehensively understood.

Formal advertising requires precise delineation of the specific requirement and all of the terms and conditions attendant thereto. Where its use is practicable and feasible it has many benefits both to the buyer and seller.

It may be expected that with some introspection, imagination and downright forceful effort, many instances may be found where, although negotiation can be justified, formal advertising may, in fact, be "feasible and practicable."

New Lightweight Body Armor Provides Buoyancy in Water

A combination body armor-life vest, which provides buoyancy in water as well as protection against explosive ordnance, has been developed by the Navy's Clothing and Textile Laboratory at the Naval Supply Center, Bayonne, N.J., and is now being tested in Vietnam.

The buoyant body armor weighs only 46 ounces, the same as a standard Navy life preserver. Conventional body armor, made of several layers of canvas-like nylon fabric or rigid fiber glass plate, weighs more than eight pounds.

Military and industrial traffic managers, who share a mutual concern for the hazards involved in the packing and shipping of dangerous materials, are becoming increasingly aware of the need to keep up to date on the best possible procedures as a result of expanding supply operations in Vietnam.

Guidelines Cited for—
Packaging and Shipment of Dangerous Materials

By

Charles P. Hutter
Joint Military Packaging Training Center
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Procedures requiring special care are only as good as the people who execute them, and those who deal with the shipment of dangerous materials need, in addition to a high sense of responsibility, a thorough knowledge of special procedures for packaging.

A survey conducted by the Air Force revealed that during calendar year 1964, the average monthly movement of dangerous materials by Air Force aircraft was 450 tons. The year of 1965 saw an increase in average monthly tonnage to the 1,200-ton mark, and 1966 is expected to show an even greater increase in dangerous materials tonnage. As tonnage increases, so does the number of Air Force flights carrying dangerous cargo, and in 1965 this figure had increased to 75 percent of all flights.

Of course, a mere increase in tonnage should not necessarily call for increased concern on the part of the Defense Department. Additional shipments of dangerous materials, if properly packaged, marked and handled, would not normally be any cause for increased concern. However, when increased shipments are coupled with ever increasing reports of improper shipments, it is easy to understand why so much attention is now being paid to the subject.

During a six-week period, the Military Airlift Command (MAC) received 438 reports of damaged or improper shipments. These reports were mainly based on visual examination of dangerous cargo exterior containers, markings, labels and related documents. The shipments covered by these reports could not be airlifted. Additional time and materials were required to bring them up to standard so that they could be shipped.

Hazards involved in packaging, shipping, or storing dangerous materials can affect property, but the primary concern is the injury to personnel which could occur if packing is not done properly.

What are dangerous materials? The Interstate Commerce Commission (ICC), as well as other regulatory agencies, have provided a definite system of classifying and identifying dangerous materials. The classification indicated by ICC will be considered first.

An explosive, for purposes of transportation, may be considered as any chemical compound or mixture, or device containing such a compound or mixture, which is designed for, and capable of, functioning by explosion, i.e., with instantaneous release of gas or heat. Explosives are subdivided into the following three categories:

- Class A. Explosives which are considered most dangerous and which detonate, or in some other way involve a maximum hazard.
- Class B. Explosives that are less dangerous, and those which function generally by rapid combustion or deflagrating.
- Class C. Explosives which are relatively soft. In general, Class C. explosives are manufactured devices which contain relatively small amounts of either Class A or Class B explosives, or both.

Forbidden explosives are those which are too dangerous to be transported.

A flammable liquid is described as any liquid that evolves flammable vapors in air at a temperature of 80° F., or below, as determined by a method specified in ICC regulations. The vapors from such liquids, when mixed with air in certain proportions, will burn if ignited. If this should occur in an inclosed space, the combustion of the vapor-air mixture may be sufficiently vigorous to stimulate an explosion.

Flammable solids include such materials, other than explosives, which can ignite through friction, absorption of moisture, spontaneous chemical changes, or as a result of retained heat from manufacturing or processing.

Oxidizing materials include all substances, such as chlorates, peroxides, perchlorates, permanganates and nitrates, that yield oxygen readily to stimulate combustion of organic matter.

Acids and corrosives are those alkaline caustic liquids which, when in contact with living tissue, will cause severe damage of such tissue by chemical action; or, in case of leakage, will materially damage or destroy other lading by chemical action; or can cause fire when in contact with organic matter or with certain chemicals. ICC regulations authorize three types of labels for these materials so that any acid or corrosive liquid can be identified appropriately.

A compressed gas is defined as any material or mixture having in the container either an absolute pressure exceeding 40 pounds per square inch at 70°F., or an absolute pressure exceeding 104 pounds per square inch at 130°F., or both; or any liquid flammable material having a Reid vapor pressure exceeding 40 pounds per square inch absolute at 100°F. Compressed gases are considered either as flammable or nonflammable depending upon the results of certain tests prescribed in ICC regulations.

Poisonous articles are divided into the following four classes according to their characteristics:

- Class A. Extremely dangerous poisonous gases or liquids. A very small amount of the gas or vapor of the liquid, when mixed with air, is perilous to life. This class includes diphosgene, lewisite, mustard gas, phosgene and similar chemicals.
- Class B. Less dangerous poisonous liquids or solids, which are hazardous to health. Oral toxicity identifies those which produce death within 48 hours when inhaled continuously for one hour. Toxicity by skin absorption identifies those which produce death within 48 hours by continuous

tact with bare skin for 24 hours or less.

• Class C. Tear gas or irritating substances. Liquid or solid substances which give off dangerous or irritating fumes when brought into contact with fire or when exposed to air.

• Class D. Radioactive materials from which certain rays are emitted that may be hazardous. Radioactive materials emit one or more of four kinds of rays (gamma, alpha, beta, or neutrons). The dangerous emanation of alpha and beta rays can be stopped comparatively easily by efficient wood or fiber packaging. Those that radiate dangerous amounts of gamma rays must be protected by a special shield, usually made of lead. Neutron emanation requires very special protection. Class D poisons are further subdivided into three groups according to the type of radiation emitted. Group I materials are those which emit any gamma radiation either alone, or with alpha or beta radiation. Group II materials emit neutrons and either or both of the types of radiation of Group I materials. Group III materials are those which emit only electrically charged particles, i.e., alpha or beta radiation.

The dangerous materials described above are those as classified by the Interstate Commerce Commission. In addition to these, the Coast Guard also regulates materials in two other categories.

The Coast Guard also lists combustible liquids as any liquids which give off flammable vapors at or below a temperature of 150°F. or above 80°F. Hazardous items include any substance which is liable to spontaneous heating in excess of 10°F. at or below temperatures of 212°F., or liberates vapor susceptible to ignition by a spark or open flame at or below 300°F.

In addition to the materials classified by the ICC and the Coast Guard, commercial aircraft require the classifications of other restricted articles. These materials are described as those which are not entirely suitable for transportation by air without some precautionary packaging. They are divided into the following three categories:

• Group A. Items not otherwise restricted which have noxious, toxic, or irritating characteristics that can cause extreme annoyance or discomfort to passengers and crew in the event of leakage in flight.

• Group B. Liquids only moderately corrosive and solids which are strongly corrosive when they are wet.

• Group C. Etiologic agents and polymerizable materials.

Now that dangerous materials have been described, at least generally, it is necessary that some of the more important documents and publications that regulate the packaging and shipment of such materials be studied.

Interstate shipments, provided that an interstate carrier is not involved, are governed by state and local regulations. Interstate shipments of dangerous materials, as well as intrastate shipments on interstate carriers, are regulated by publications which are generally a part of the U.S. Code.

For clarity, the various documents are indicated in two categories: storage documents and packaging and shipping documents.

Storage Documents.

Army Materiel Command Regulation 385–224, Air Force Manual 127–100, and Bureau of Naval Weapons Ordnance Pamphlet No. 5, Volume 1, deal essentially with the storage and processing of explosives. These documents establish quantity-distance designations (the weight limitation of a given explosive that may be stored within a given minimum distance from a railroad, building, magazine or other facility) and storage compatibility designations.

The amount of explosive material that can be assembled or packaged in a given facility may not depend on available equipment or floor space, but upon the quantity-distance class. Expensive concrete walls, revetments, or additional facilities, not in the budget, may be required to meet processing schedules.

Packaging and Shipment Documents.

Air Force Manual 71–4, a joint service document, titled "Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft," includes a listing of dangerous materials most likely to be within the military supply system, an indication of their acceptability for air shipment, hazardous properties of each material, storage and handling data and packaging and marking information.

The Official Air Transport Restricted Articles Tariff No. 6–3 is a publication relating to the packaging and shipment of restricted articles and is published by an agent for the participating carriers. The tariff contains restrictions which determine whether a particular article will be accepted for transportation and specifies packaging requirements for these items.

Title 14, Code of Federal Regulations, Part 49, provides statutory requirements of the Federal Aviation Agency.

Documentation pertaining to the packaging and shipment of dangerous materials by water is contained in the following regulations:

Agent T. C. George's Water Carrier Tariff No. 16 is a publication issued by an agent for the water carriers and indicates the condition under which the water carriers will accept dangerous materials for shipment. The document is, in effect, a transcription of the U.S. Coast Guard Regulations, with minor additions such as the listing of participating carriers.

The basic legal document governing the transporting of dangerous materials aboard vessels is *Title 46, Code of Federal Regulations, Parts 146 to 149.* This document indicates Coast Guard regulations and, as such, is essentially the same as T. C. George's Water Carrier Tariff No. 16.

CG 108, Rules and Regulations for Military Explosives and Hazardous Munitions, is a publication of the Coast Guard and contains excerpts from Coast Guard Regulations (*Title 46 CFR Part 146*).

Surface documents, or those documents which govern shipment of dangerous materials by truck, express, railway and inland waterways not under Coast Guard jurisdiction, are as follows:

Agent T. C. George's Tariff No. 15, which published the ICC regulations, contains, in addition to other materials, a list of explosives and other dangerous articles by commodity groupings, together with shipping descriptions, packing, marking and labeling requirements, and shipper's certificate of compliance to the regulations. Tariff No. 15 is divided into eight different parts, each part generally pertaining to a different group of carriers and shippers. Of particular note are the shipping container specifications included in this publi-

cation. The document, published by the Bureau of Explosives, is the most up-to-date publication in the field and should be considered the basic publication for packaging and shipping dangerous materials.

In the *Motor Carriers' Explosives and Dangerous Articles Tariff No. 11*, the American Trucking Associations, Inc., is acting as agent for the motor carriers and publishes the ICC regulations. Contents of this tariff are essentially the same as published in Tariff No. 15.

Title 49, Code of Federal Regulations, Parts 71–79, is the basic legal document containing the rules and regulations of the ICC. The description previously indicated for George's Tariff No. 15 is also suitable to the contents of 49 CFR 71–79.

Other documents of help in determining packaging and shipping requirements for dangerous materials are the *Bureau of Explosives Pamphlets 6, 6A, 6C and 7*. These documents provide general instructions and loading and bracing illustrations for explosives in trucks and rail cars. In addition to these pamphlets, shippers should be fully aware of appropriate local and state requirements regarding the packaging and shipment of dangerous materials. In many cases, state and local governments specify compliance with the requirements of the ICC.

Don't guess or trust packaging requirements for dangerous materials to memory. Use the regulations that exist, and be sure that your shipment will not cause death or injury to someone, or that you will not be subject to fine or imprisonment.

Those of you who are concerned with the packaging and shipment of dangerous materials should add one final procedure to your standard way of doing business. Your final act, prior to shipping dangerous materials, should be to ask yourself, "Do I want this package transported through my community or past my home?"

NOTICE

Postal regulations require the use of Zip Codes in mailing the *Defense Industry Bulletin* to United States subscribers. Please include your Zip Code when requesting subscription of the *Bulletin*.

List of BDSA Regulations, Orders and Related Actions

(As of Oct. 11, 1966)

Regulations

DMS Reg. 1 (as amended Dec. 1, 1959)	Basic Rules of the Defense Materials System.
Amendment 2 (March 15, 1966) to DMS Reg. 1.	
Dir. 1 (Dec. 1, 1959) to DMS Reg. 1.	
Dir. 2 (Dec. 1, 1959) to DMS Reg. 1.	
Dir. 3 (Dec. 1, 1959) to DMS Reg. 1.	
BDSA Reg. 1 (Oct. 1, 1953)	Ratification of Previous Actions.
BDSA Reg. 2 (as amended Mar. 23, 1953)	Basic Rules of the Priorities System.
Amendment 5 (May 9, 1958) to Reg. 2.	
Amendment 6 (Apr. 27, 1960) to Reg. 2.	
Amendment 7 (July 21, 1964) to Reg. 2.	
Amendment 8 (Feb. 23, 1966) to Reg. 2.	
Dir. 4 (as amended Apr. 30, 1952) to Reg. 2.	
Dir. 7 (June 29, 1956) to Reg. 2.	
Dir. 7, Amendment 1 (May 9, 1958) to Reg. 2.	
Dir. 8 (Jan. 18, 1957) to Reg. 2.	
BDSA Reg. 3 (as amended Feb. 1, 1955)	Operations of the Priorities and Allocations Systems between Canada and United States.
BDSA Reg. 5 (as amended Oct. 11, 1951)	Appeals.
BDSA Reg. 6 (Nov. 5, 1951)	Transfer of Quotas and Ratings; Transfer of a Business as a Going Concern.
BDSA Reg. 7 (Apr. 23, 1952)	Interpretations of BDSA (formerly NPA) Regulations and Orders.
BDSA Reg. 8 (May 15, 1956)	Compliance and Enforcement Procedures.

Orders

M-1A (May 14, 1953)	Iron and Steel.
Amendment 1 (June 26, 1953) to M-1A.	
Amendment 3 (Oct. 7, 1953) to M-1A.	
Amendment 4 (Jan. 20, 1958) to M-1A.	
Dir. 1 (Oct. 16, 1959) to M-1A.	
Dir. 1, Amendment 1 (Nov. 17, 1959) to M-1A.	
M-1B (June 29, 1950)	Nickel Alloys.
Amendment 1 (Aug. 17, 1956) to M-1B.	
Amendment 2 (Jan. 20, 1958) to M-1B.	
M-5A (May 6, 1953)	Aluminum.
Amendment 1 (Dec. 31, 1955) to M-5A.	
Amendment 2 (Jan. 20, 1958) to M-5A.	
M-11A (as amended Dec. 18, 1956)	Copper and Copper-base Alloys.
Amendment 1 (Jan. 20, 1958) to M-11A.	
Schedule A (Revised Aug. 16, 1966) to M-11A.	
Dir. 1 (Nov. 16, 1965) to M-11A.	
Dir. 2 (Feb. 23, 1966) to M-11A.	
Dir. 2, Amendment 2 (Aug. 16, 1966) to M-11A.	
M-17 (as amended Sept. 4, 1959)	Electronic Components or Parts.
M-41 (as amended May 24, 1963)	Metalworking Machines.
M-43A (May 6, 1953)	Construction Machinery: Distribution.

Delegations

Del. 1 (as amended May 31, 1960)	Delegation of Authority to Secretary of Defense.
Del. 2 (as amended May 31, 1960)	Delegation of Authority to Atomic Energy Commission.
Del. 3 (May 8, 1963)	Delegation of Authority to Administrator of General Services.
Del. 9 (Feb. 26, 1951)	Secretary of Interior Delegation of Authority with Respect to Certain Industrial Chemicals Used Principally in the Petroleum Industry.
Del. 10 (Apr. 26, 1951)	Administrator of Production and Marketing Administration Delegation of Authority to Exercise Certain Functions.
Emergency Del. 1 (as amended March 23, 1962).	Emergency Delegation of Priorities and Allocation Powers.

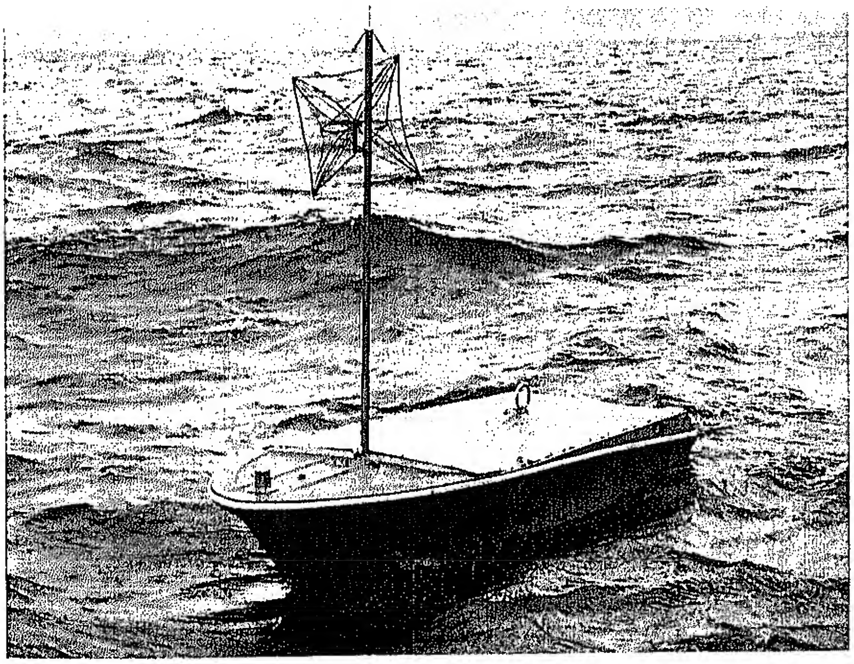
Notice

Notice 2 (as amended Mar. 1, 1954) Reporting Del. 2 (Oct. 11, 1966.	Signature of Official BDSA Actions.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July-Aug. 1966	July-Aug. 1965
Procurement from All Firms	$6,778,000	$4,867,500
Procurement from Small Business Firms	1,406,800	972,800
Percent Small Business	20.8	20.0



DESTINED FOR DESTRUCTION, a Firefish target boat drifts calmly off the coast of Southern California. The radio-controlled target system, ordered into production in 1964 after U. S. ships were attacked by surface craft in the Gulf of Tonkin, is used by the Navy to simulate enemy PT-boats during fleet gunnery exercises. The Firefish is 17 feet long and is built of reinforced fiberglass. It has a 120-horsepower inboard engine, can make speeds up to 30 knots and it can be controlled by surface vessels or aircraft.

Boeing Selected To Develop and Produce SRAM

The Boeing Co., Seattle, Wash., has been selected by the Air Force to develop and produce the AGM-69A Short Range Attack Missile (SRAM). It will be acquired under the Total Package Procurement Concept which calls for all development and production options to be procured in one contractual package.

The AGM-69A, an air-to-surface missile, will provide aircraft with the stand-off capability to attack heavily defended targets. It will be carried by the FB-111 bomber and will be adaptable to late model B-52 bombers.

The Boeing Co., under this firm fixed price incentive contract, will complete the development of SRAM at a target price of $142.3 million. The target price for the approved production quantity is $93.5 million.

The AGM-69A System Program Office of the Air Force System Command's Aeronautical Systems Division, Wright-Patterson AFB, Ohio, will manage development and procurement of the weapon system.

USAF Awards Contract for A-7D Attack Aircraft

The Air Force will begin procurement of the A-7D Corsair II attac aircraft under a $19,147,000 letter contract awarded Oct. 31 to LTV Aerospace Corp., Dallas, Tex. The A-7D is the Air Force version of the Navy A-7A.

First delivery of production aircraft will be in 1968, with the first wing scheduled to be operational in 1969

U.S. Department of Commerce Field Offices

Albuquerque, N. M. 87101
U. S. Courthouse
Phone: Area Code 505, 247-0311

Anchorage, Alaska 99501
306 Loussac Sogn Building
Phone: Area Code 907, 272-6331

Atlanta, Ga. 30303
4th Floor, Home Savings Building
75 Forsyth St., N.W.
Phone: Area Code 404, 526-6000

Baltimore, Md. 21202
305 U.S. Customhouse
Gay and Lombard Streets
Phone: Area Code 301, Plaza 2-8460

Birmingham, Ala. 35205
Suite 200-201, 908 South 20th St.
Phone: Area Code 205, 325-3327

Boston, Mass. 02203
Room 510, John Fitzgerald Kennedy Federal Building
Phone: Area Code 617, CA 3-2312

Buffalo, N. Y. 14203
504 Federal Building
117 Ellicott St.
Phone: Area Code 716, 842-3208

Charleston, S. C. 29403
Federal Building—Suite 631
334 Meeting St.
Phone: Area Code 803, 747-4171

Charleston, W. Va. 25301
3002 New Federal Office Building
500 Quarrier St.
Phone: Area Code 304, 343-6196

Cheyenne, Wyo. 82001
6022 Federal Building
2120 Capitol Ave.
Phone: Area Code 307, 634-5920

Chicago, Ill. 60604
1486 New Federal Building
219 South Dearborn St.
Phone: Area Code 312, 828-4400

Cincinnati, Ohio 45202
8028 Federal Office Building
550 Main St.
Phone: Area Code 513, 684-2944

Cleveland, Ohio 44101
4th Floor,
Federal Reserve Bank Building
East 6th St., and Superior Ave.
Phone: Area Code 216, 241-7900

Dallas, Tex. 75202
Room 1200, 1114 Commerce St.
Phone: Area Code 214, RIverside 9-3287

Denver, Colo. 80202
16407 Federal Building
20th and Stout Streets
Phone: Area Code 303, 297-3246

Des Moines, Iowa 50309
1216 Paramount Building
509 Grand Ave.
Phone: Area Code 515, 284-4222

Detroit, Mich. 48226
445 Federal Building
Phone: Area Code 313, 226-6088

Greensboro, N. C. 27402
412 U.S. Post Office Building
Phone: Area Code 919, 275-9111

Hartford, Conn. 06103
18 Asylum St.
Phone: Area Code 203, 244-3530

Honolulu, Hawaii 96813
202 International Savings Building
1022 Bethel St.
Phone: 588977

Houston, Tex. 77002
5102 Federal Building
515 Rusk Ave.
Phone: Area Code 713, 228-0611

Jacksonville, Fla. 32202
512 Greenleaf Building
208 Laura St.
Phone: Area Code 904, 354-7111

Kansas City, Mo. 64106
Room 2011, 911 Walnut St.
Phone Area Code 816, FR 4-3141

Los Angeles, Calif. 90015
Room 450, Western Pacific Building
1031 South Broadway
Phone: Area Code 213, 688-2833

Memphis, Tenn. 38103
345 Federal Office Building
167 North Main St.
Phone: Area Code 901, 534-3214

Miami, Fla. 33130
928 Federal Office Building
51 S. W. First Ave.
Phone: Area Code 305, 350-5267

Milwaukee, Wis. 53203
Straus Building
238 West Wisconsin Ave.
Phone: Area Code 414, BR 2-8600

Minneapolis, Minn. 55401
306 Federal Building
110 South Fourth St.
Phone: Area Code 612, 334-2133

New Orleans, La. 70130
909 Federal Office Building, South
610 South St.
Phone: Area Code 504, 527 6546

New York, N. Y. 10001
61st Floor, Empire State Building
350 Fifth Ave.
Phone: Area Code 212, LOngacre 3-3377

Philadelphia, Pa. 19107
Jefferson Building
1015 Chestnut St.
Phone: Area Code 215, 597-2850

Phoenix, Ariz. 85025
5413 New Federal Building
230 North First Ave.
Phone: Area Code 602, 261-3285

Pittsburgh, Pa. 15222
2201 Federal Building
1000 Liberty Ave.
Phone: Area Code 412, 644-2850

Portland, Ore. 97204
217 Old U. S. Courthouse
520 S. W. Morrison St.
Phone: Area Code 503, 226-3361

Reno, Nev. 89502
2028 Federal Building
300 Booth St.
Phone: Area Code 702, 784-5203

Richmond, Va. 23204
2105 Federal Building
400 North 8th St.
Phone: Area Code 703, 649-3611

St. Louis, Mo. 63103
2511 Federal Building
1520 Market St.
Phone: Area Code 314, MA 2-4243

Salt Lake City, Utah 84111
3235 Federal Building
125 South State St.
Phone: Area Code 801, 524-5116

San Francisco, Calif. 94102
Federal Building, Box 36013
450 Golden Gate Ave.
Phone: Area Code 415, 556-5864

Santurce, P. R. 00907
Room 628, 605 Condado Ave.
Phone: 723-4640

Savannah, Ga. 31402
235 U.S. Courthouse and Post Office Building
125-29 Bull St.
Phone: Area Code 912, 232-4321

Seattle, Wash. 98104
809 Federal Office Building
909 First Ave.
Phone: Area Code 206, 583-5615

Army Develops Lightweight Fuel Supply System

A lightweight auxiliary fuel supply system for use with permanently or semi-permanently installed engine-driven equipment is being developed by the U. S. Army Mobility Equipment Command's Engineer Research and Development Laboratories, Fort Belvoir, Va.

The 15-pound system, which can be installed in a fuel drum in only 10 minutes, features a specially designed submersible 24-volt electric pump, two and one-eighth inches in diameter and 12 inches long, with a capacity rate of 45 gallons an hour.

Equipped with 50 feet of half-inch hose, the pump may be located at various depths within the fuel container by means of a drum adapter positioned at any point on the hose. Electric leads are embedded in or threaded through the hose and connected to the engine fuel and electric system by a quick-disconnect combination coupling.

The new system is designed to eliminate vapor lock and safety hazards, to operate over a wide temperature range, and to provide flexibility in the location of auxiliary fuel drums and tanks. It may be adapted for use as a fuel transfer system or as a refueling system for mobile equipment.

Design and performance requirements for the system are contained in Military Specification MIL P-52493 (MO) and Military Standard MS 39280 (MO).

Civilian Reserve
(*Continued from Page 20*)
section does not include advising, consulting, or acting on any matter pending before any department or agency.

Responsibilities of Reserve Units.

When reservists are called up they will be assigned, in the field or in Washington, to responsibilities for which they have been trained by their units. Obviously these responsibilities vary widely in character, depending on the department or agency. Here are some examples of responsibility in the event of emergency:

Department of Agriculture. Defend crops, livestock and poultry against radiological fallout and biological and chemical warfare agents; analyze food requirements and supplies; assess attack effects on agricultural and food resources; estimate needs and claims for manpower, equipment, supplies and services.

Department of Defense. Disseminate survival instructions and other civil defense information to the public through all available media, including the Emergency Broadcasting System.

Department of Commerce. Issue priorities and directives to expedite industrial mobilization and recovery; allocate civil transportation capacity to meet essential needs; direct ocean vessel movements, allocate tonnage, requisition ships and reactivate reserve fleet ships; survey and construct vital highways; provide statistical data on manufacturers, trade and transportation.

Department of the Interior. Direct and control fuel, energy and mineral resources with state and local government participation.

Department of Labor. Subject to authorization by Congress or the President, emergency manpower registration by skill, age, physical fitness; requiring personal services necessary to meet essential survival requirements.

Federal Communication Commission. Work with appropriate resource agencies to insure availability of materials, manpower, equipment, supplies and services to support common carriers and commission licenses. Claim such resources as needed.

Interstate Commerce Commission. Allocate the use of domestic interstate surface transportation and storage to operators and users; administer priorities systems necessary to movement of essential freight and passengers.

Department of Housing and Urban Development. Direct construction, repair and management of emergency housing and related facilities; act as claimant for their material requirements.

Office of Emergency Planning. Coordinate, in behalf of the President the broad field of emergency mobilization, including the Executive Reserve and, if needed and authorized, wage and price stabilization.

Assignment of Members.

Reservists assigned to national headquarters will report to Government relocation sites in the time of an emergency mobilization. Reservists assigned to one of the eight regional Federal Emergency Centers will report to the field offices. Each center should be housed in hardened underground sites protected against nuclear attack and fallout. Certain of these sites are now in use. Others are scheduled for early completion.

Contracting for Logistic Support
(*Continued from Page 31*)
of integrated logistics management is another thrust in this direction.

Specification WR-30 is another thrust. Here we enter into contracts which call for the producer to make those parts and components he needs to keep ahead of final assembly, but at the same time make those same parts and components immediately available to us for deployment support where necessary. We have to make our withdrawal decisions in time to permit the contractor to make up more parts and components to keep his production line going under the prime contract system. But the point is, we are relying on the contractor for this material support rather than simply buying up a provisioning quantity at the outset and putting it on our shelves to hold until we need it.

Conclusion.

The sub-title to my remarks was labelled as the "Government position". It is difficult, of course, to call something a "position" unless you say I'm for it or I'm against it. The position expressed here may seem to be equivocal and ambiguous.

Let me conclude, therefore, by summarizing what the position is. We have a proven and demonstrated support system in the Military Services today. We have professionals whose lives are devoted exclusively to the methodology and techniques of supply management, maintenance management and support.

These professionals are responsive to command. And at the same time they are responsive to the demands of economy. For this latter reason, these same professionals are constantly seeking, developing and implementing new and better ways to do the support job.

Contracting for logistic support is one of the ways to which the professionals are wholly open minded. They are not only receptive, but are carefully expanding into this, the contracting approach. We are gaining in experience in this approach and, with this experience, we are refining our contractual instruments to give us progressively greater assurance that the support will be there when it is needed.

As we gain in experience and refinement, we expect to gain in contractor response and gain in confidence as well. In the final analysis, it is something like learning to ride a bicycle. It scares the kid the first time he takes off. But as he learns how to achieve and maintain his balance, and as he gains in experience, he gains in confidence as well.

Pretty soon he sails past the house and hollers, "Look Ma, no hands. . ."

That is the direction in which we are going in contractor support. But we don't want to crash in the process.

That's the Government's position, as best I can state it.

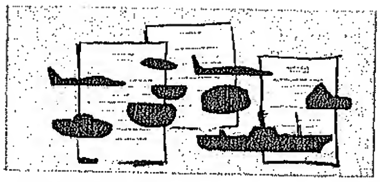
Air Force to Catalog Satellite Radar Portraits

Satellite shapes will "sit" for a gallery of electronic portraits as part of an Air Force program to develop a catalog of images of possible space vehicle shapes which can be applied to radar observation of objects orbiting the earth.

The Electronic Systems Division of the Air Force Systems Command plans to take electronic measurements of some two dozen satellite models, ranging in size from four-inches to nine-feet long.

Models are basically cylindrical and cone shaped, modified with flaring ends or rounded noses. These relatively plain shapes will also be equipped with fins, spikes representing antennae and rods running the length of the body.

The electronic portraits will be taken on the Radar Target Scatter installation of the Air Force Missile Development Center, Holloman AFB, N.M., during 2,000 hours of tests running through December. Models will be suspended in front of a radar and mechanically rotated to simulate spinning, tumbling and other movements.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of October 1966:

DEFENSE SUPPLY AGENCY

4—Saddler Textiles, Inc., New York City, N.Y. $1,531,595. 949,000 square yds of cotton duck cloth. Defense Personnel Support Center, Philadelphia, Pa.

6—Lester D. Lawson & Co., Long Beach, Calif. $1,601,397. 46,620 cases of ration supplement sundry packs. Defense Personnel Support Center, Philadelphia, Pa.

7—The Defense Personnel Support Center, Philadelphia, Pa., has issued the following contracts for black combat boots:
Gardiner Shoe Co., Gardiner, Maine. $1,-493,999. 125,000 pairs.
B. B. Walker Shoe Co., Asheboro, N.C. $1,342,800. 120,000 pairs.
Brooks Shoe Mfg. Co., Hanover, Pa. $1,084,999. 84,000 pairs.
Addison Shoe Corp., Wynne, Ark. $1,-480,500. 150,000 pairs.
International Shoe Co., St. Louis, Mo. $2,058,000. 200,000 pairs.
J. W. Carter, Nashville, Tenn. $3,680,000. 300,000 pairs.
Safety First Shoe Co., Nashville, Tenn. $1,770,720. 186,000 pairs.
Cumberland Shoe Co., Franklin, Tenn. $1,160,000. 100,000 pairs.
Brown Shoe Co., St. Louis, Mo. $1,796,-900. 170,000 pairs.
Sportwelt Shoe Co., Nashua, N.H. $2,-172,192. 200,000 pairs.

—Endicott Johnson Corp., Endicott, N.Y. $1,148,268. 100,000 pairs of mildew resistant safety shoes. Endicott. Defense Personnel Support Center, Philadelphia, Pa.

—J. P. Stevens & Co., New York City, N.Y. $1,195,380. 600,003 yds of wind resistant sateen cloth. New York City. Defense Personnel Support Center, Philadelphia, Pa.

10—Flexible Tubing Corp., Guilford, Conn. $2,-261,221. 264,780 pheumatic mattresses. Guilford. Defense Personnel Support Center, Philadelphia.

12—Abate Clothing, Inc., Atlantic City, N.J. $1,940,000. 50,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

—Wales Mfg. Co., Boston, Mass. $1,010,750. 25,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

13—Morris Bros., New York City, N.Y. $1,-496,552. 3,000,000 cotton bath towells. Defense Personnel Support Center, Philadelphia, Pa.

18—Republic Steel Corp., Chicago, Ill. $1,897,-330. 183,140 spools of barbed wire (80 rods). Defense Construction Supply Center, Columbus, Ohio.

—M. Wile & Co., Buffalo, N.Y. $1,226,800. 40,000 men's polyester wool tropical coats. Defense Personnel Support Center, Philadelphia, Pa.

19—American Tent Co., Canton, Miss. $1,289,-227. 9,700 general purpose, medium size, tent liners. Defense Personnel Support Center, Philadelphia, Pa.

—Sun Garden Packing Co., San Jose, Calif. $1,094,000. 200,000 cases of No. 10 cans of tomatoes. Defense Personnel Support Center, Philadelphia, Pa.

—E. I. DuPont de Nemours & Co., Wilmington, Del. $4,899,234. 109,800 rolls of aerial photographic film. Defense General Supply Center, Richmond, Va.

—Eastman Kodak Co., Rochester, N.Y. $1,-307,376. 100,800 rolls of aerial photographic film. Defense General Supply Center, Richmond, Va.

CONTRACT LEGEND
Contract information is listed in the following sequence: Date—Company — Value — Material or work to be Performed—Location of Work Performed — Contracting Agency.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for fuel oil and gasoline:
Gulf Oil Corp., Houston, Tex. $5,084,011; Sinclair Refining Co., New York City, N.Y., $1,644,988 and Hess Oil and Chemical Corp., Perth Amboy, N.J., $1,397,705.

20—American Tent Co., Canton, Miss. $2,015,-880. 12,000 general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

21—Ethyl Corp., New York City, N.Y. $1,402,-712. 7,000 ten-gallon drums of smoke suppressant additives. Defense General Supply Center, Richmond, Va.

—Burlington Industries, New York City, N.Y. $2,530,315. 2,000,000 linear yds of wind-resistant sateen cloth. Defense Personnel Support Center, Philadelphia, Pa.

—C. M. London Co., New York City, N.Y. $2,045,252. 1,348,222 linear yds of wind-resistant sateen cloth. Defense Personnel Support Center, Philadelphia, Pa.

24—E.C.T. Corp., Fayetteville, N.C. $1,151,241. 360,000 pairs of men's white trousers. Defense Personnel Support Center, Philadelphia, Pa.

26—Hart Metals, Inc., New York City, N.Y. $3,347,775. Magnesium powder. Defense General Supply Center, Richmond, Va.

27—Koch Refrigerators, Kansas City, Mo. $1,-258,000. 200 refrigerators. Defense General Supply Center, Richmond, Va.

28—The Defense Personnel Support Center, Philadelphia, Pa., has awarded the following contracts for men's polyester-wool tropical coats:
Albert Turner Co., New York City, N.Y. $2,176,500. 75,000; Bannercraft Clothing Co., Philadelphia, Pa., $1,881,000. 60,000; Howard Stores Corp., Brooklyn, N.Y. $1,-510,000. 50,000. Raleigh Mfg., Inc., Baltimore, Md. $1,122,400. 40,000. Richmond Bros., Co., Cleveland, Ohio. $1,-001,400. 30,000.

—La Crosse Garment Mfg. Co., La Crosse, Wis. $2,738,087. 190,586 regular sleeping bags and 84,448 large-size mountain sleeping bags. Defense Personnel Support Center, Philadelphia, Pa.

—Tennessee Overall Co., Tullahoma, Tenn. $1,552,785. 520,000 pairs of men's polyester and wool tropical trousers. Defense Personnel Support Center, Philadelphia, Pa.

—Robert Lawrence Co., Boston, Mass. $1,-126,876. 37,480 men's wool serge overcoats. Defense Personnel Support Center, Philadelphia, Pa.

—Goodstein Bros. and Co., New York City, N.Y. $1,615,500. 50,000 men's wool serge overcoats. Defense Personnel Support Center, Philadelphia, Pa.

31—Peoples Co., Huntington, W. Va. $2,688,-580. 11,428 small general purpose tents and 12,193 vestibules for small general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—H. Wenzel Tent & Duck Co., St. Louis, Mo. $1,508,826. 6,528 small general purpose tents and 5,000 vestibules for small general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—Mobil Oil Corp., New York City, N.Y. $10,424,400. 4,380,000 barrels of Navy Special Fuel Oil. Defense Fuel Supply Center, Alexandria, Va.

ARMY

3—Donovan Construction Co., St. Paul, Minn. $2,639,875. 155mm high explosive projectiles. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Defense Metal Products, Inc., Sylacauga, Ala. $2,919,127. 155mm high explosive projectiles. Sylacauga. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Continental Motors Corp., Muskegon, Mich. $1,490,019. Crank shaft assemblies for combat trucks. Muskegon. Army Tank Automotive Command, Warren, Mich.

—Menominee Engineering Corp., Menominee, Mich. $1,788,600. Bridge component parts. Menominee. Army Mobility Equipment Command, St. Louis, Mo.

—General Electric, Burlington, Vt. $7,848,-428. Spare parts for the XM12 armament pod and the M61A1 automatic 20mm aircraft cannon. Burlington. Army Weapons Command, Rock Island, Ill.

5—Halvorson-Mason, Portland, Ore. $1,072,-140. Work on the John Day Lock and Dam Project. Near The Dalles, Ore. Engineer Dist., Walla Walla, Wash.

—Hanson Machinery Co., Tiffin, Ohio. $1,-572,636. 5-ton cranes. Tiffin. Army Mobility Equipment Command, St. Louis, Mo.

—Aerojet General Corp., Downey, Calif. $1,-350,000. Metal parts for 2.75-inch rockets. Downey. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Canadian Commercial Corp., Ottawa, Canada. $1,141,500. Metal parts for 2.75-inch rockets. Ottawa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Morrison Knudsen Corp., and Perini Corp., Titusville, Fla. $2,346,838. Construction work at NASA Launch Complex No. 39 at the Kennedy Space Center, Fla. Canaveral Engineer Dist., Merritt Island, Fla.

—John F. Beasley Co. and Novo Industrial Corp., Dallas, Tex. $6,609,695. Work on the Inland Waterway, Delaware River to Chesapeake Bay, Project. Engineer Dist., Philadelphia, Pa.

7—Motor Wheel Corp., Division of Goodyear Tire & Rubber Co., Lansing, Mich. $1,531,-710. Road wheels for M48 tanks. Lansing. Army Tank Automotive Center, Warren, Mich.

—Firestone Tire & Rubber Co., Akron, Ohio. $1,487,086. Track assemblies for M113 vehicles. Noblesville, Ind. Army Tank Automotive Center, Warren, Mich.

—FMC Corp., Charleston, W. Va. $2,919,359. Track assemblies for M113 vehicles. Charleston. Army Tank Automotive Center, Warren, Mich.

—Emerson Electric Co., St. Louis, Mo. $1,-416,680. Design and development of the XM28 aircraft armament subsystem for AH-1G Huey Cobra helicopters. St. Louis. Army Weapons Command, Rock Island, Ill.

10—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $3,500,000. Items and components for the CH-54A helicopter. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—Ford Motors, Dearborn, Mich. $33,720,544. ¼-ton trucks. Highland Park, Mich. Project Manager, General Purpose Vehicles, Warren, Mich.

—General Motors, Cleveland, Ohio. $1,125,-000. Production of repair parts for the M551 vehicle. Cleveland. Army Weapons Command, Rock Island, Ill.

—Koehring Co., Thew Lorain Div., Lorain, Ohio. $2,347,130. Diesel engine driven, 12½-ton capacity, crane shovels. Lorain. Mobility Equipment Command, St. Louis, Mo.

11—Philco Corp., Newport Beach, Calif. $2,-800,000. Continued research and development on the Chaparral air defense missile system. Newport Beach. Army Missile Command, Huntsville, Ala.

—Continental Motors Corp., Muskegon, Mich. $6,470,742. Engine assemblies with accessories for ¼-ton utility trucks. Muskegon. Project Manager, General Purpose Vehicles, Warren, Mich.

—Otis Elevator Co., Atlanta, Ga. $1,129,333. Modification of two elevators and to furnish and install three new elevators in the vehicle assembly building at Launch Complex 39, Kennedy Space Center, Fla. Canaveral Engineer Dist., Merritt Island, Fla.

—A. O. Smith Corp., Chicago, Ill. $1,348,705. Acquisition and fabrication of equipment to be installed in contractor's plant at Waco, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

13—AVCO Corp., Stratford, Conn. $10,378,440. Modification kits for the T53-L13 engine. Stratford. Army Aviation Command, St. Louis, Mo.

—General Motors, Santa Barbara, Calif. $2,-040,000. Continuation of an Advanced Research Project Agency sponsored hyper-velocity range research program. Santa Barbara. Army Missile Command, Huntsville, Ala.

—Martin K. Eby Construction Co., Wichita, Kan. $8,098,766. Work at the Broken Bow Dam and Reservoir Project. McCurtain Country, Okla. Engineer Dist., Tulsa, Okla.

—Goss Co., Chicago, Ill. $1,000,000. One offset press. Chicago. Army Electronics Command, Fort Monmouth, N.J.

14—Edward R. Marden Corp., Allston, Mass. $1,422,400. Construction of a Federal Regional Center for the Office of Civil Defense and Office of Emergency Planning. Maynard, Mass. New England Engineer Dist., Waltham, Mass.

—Eugene Luhr & Co., and Pine Bluff Sand & Gravel Co., Columbia, Ill. $1,932,133. Construction work on the Arkansas River and Tributaries Lock and Dam Project. Dumas, Ark. Engineer Dist., Little Rock, Ark.

—Dunbar & Sullivan Dredging Co., Detroit, Mich. $1,382,000. Dredging and excavation work at the Cordell Hull Project. Carthage Tenn. Engineer Dist., Nashville, Tenn.

—RCA, Camden, N.J. $1,386,937. Portable radio sets. Camden. Army Electronics Command, Philadelphia, Pa.

—Hughes Aircraft, Culver City, Calif. $3,917,972. FY 1967 TOW missile research & development. Culver City. Army Missile Command, Huntsville, Ala.

—American Machine & Foundry Co., Brooklyn, N.Y. $2,322,768. Production facilities for bomb components. Brooklyn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—A. O. Smith Corp., Chicago, Ill. $8,473,009. Metal parts for 750-pound bombs. East Chicago, Ind., Dangerfield, Tex. and Waco, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Magnavox Co., Fort Wayne, Ind. $3,000,000. Radio communication sets. Fort Wayne. Army Electronics Command, Fort Monmouth, N.J.

17—Price Bros. Co., Dayton, Ohio. $1,078,920. Construction and maintenance dredging work at the Green Bay Harbor, Wis., Project. Engineer Dist., Chicago, Ill.

—Barber-Green Co., Aurora, Ill. $2,465,990. Ten diesel engine driven, asphalt mixing plants. Aurora. Army Mobility Equipment Command, St. Louis, Mo.

—Coleman Bros, Inc., Readville, Mass. $1,071,205. (NASA funds). Construction of foundations for a high rise lab-administration building, a microwave lab; an auditorium-cafeteria building and a utility support building at the NASA Electronic Research Center, Cambridge, Mass. New England Engineer Dist., Waltham, Mass.

18—Peter Kiewit Sons' Co. and Chris Berg, Inc., Omaha, Neb. $4,466,000. Construction of an unlined tunnel for a POL (petroleum, oils and lubricants) pipeline being installed between Whittier and Anchorage, Alaska. Engineer Dist., Anchorage, Alaska.

—Chrysler Corp., Warren, Mich. $1,467,821. Booster adapters for bombs. Warren. Procurement Detachment, Chicago, Ill.

—Basalt Rock Co., Napa, Calif. $1,031,701. Work on the Sacramento River bank protection project. Between Rio Vista and Sacramento, Calif. Engineer Dist., Sacramento, Calif.

19—Holston Defense Corp., Kingsport, Tenn. $2,668,300. Various explosives and operation and maintenance activities at the Holston Army Ammunition Plant, Kingsport, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Appalachian Power Co., New York City, N.Y. $1,522,197. Operation of the Government owned power plant at the Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Atlas Chemical Industries, Wilmington, Del. $7,107,879. TNT and for operation and maintenance activities at the Volunteer Army Ammunition Plant, Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Hamilton Watch Co., Lancaster, Pa. $1,798,651. Rocket fuzes. Lancaster. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Ajax Hardware Corp., City of Industry, Calif. $3,018,000. Fuzes for 81mm mortar shells. City of Industry. Ammunition Procurement & Supply Agency, Joliet, Ill.

—L. G. Barcus & Sons, Kansas City, Kan. $1,351,206. Work on the Des Moines, Iowa, local flood protection project. Des Moines. Engineer Dist., Rock Island, Ill.

—Chrysler Motors, Detroit, Mich. $2,071,099. M601 vehicles (one-ton power wagons). Detroit. Army Tank Automotive Command, Warren, Mich.

20—AVCO Corp., Stratford, Conn. $4,273,320. T55-L-7 engines for CH-47 helicopters. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—Mohawk Rubber Co., Akron, Ohio. $1,106,000. Pneumatic tires, 1100x20, 12 ply, truck and bus, for the six-ton wrecker. Akron. Army Tank Automotive Command, Warren, Mich.

—U.S. Rubber & Tire Co., Detroit, Mich. $1,815,447. Pneumatic tires, 1100x20, 12 ply, truck and bus for the six-ton wrecker. Los Angeles, Calif. Army Tank Automotive Command, Warren, Mich.

—Union Carbide Corp., New York City, N.Y. $1,580,922. Batteries for AN/PRC-25 radio sets. Cleveland, Ohio. Army Electronics Command, Philadelphia, Pa.

—RCA, Camden, N.J. $1,529,450. Compact lightweight radio sets, AN/GRC-50, for ground stations. Camden. Army Electronics Command, Philadelphia, Pa.

—General Electric, Burlington, Vt. $2,155,320. Repair parts for 7.62mm aircraft guns. Burlington. Army Weapons Command, Rock Island, Ill.

—Martin Marietta Corp., Orlando, Fla. $3,000,000. Exploratory development of selected Pershing components. Orlando. Army Missile Command, Huntsville, Ala.

21—Wittronics Mfg., Inc., Boyertown, Pa. $1,156,464. Fuzes (M423) for 2.75 inch rockets. Boyertown. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Chrysler Motors, Detroit, Mich. $1,135,485. Engine assemblies for ¾-ton trucks. Marysville, Mich. Army Tank Automotive Center, Warren, Mich.

—Norris Thermador Corp., Los Angeles, Calif. $1,330,947. Procurement of new production equipment and reactivation of existing equipment at the Army Ammunition Plant, Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Sperry Rand Corp., New York City, N.Y. $9,637,599. Explosives and for operation and maintenance activities at the Louisiana Army Ammunition Plant, Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.

24—General Motors, Detroit, Mich. $1,196,821. 25 ampere regulations for ¼-ton, ¾-ton and 2½-ton trucks. Anderson, Ind. Army Tank Automotive Command, Warren, Mich.

—General Tire & Rubber Co., Akron, Ohio. $2,843,740. 7.62mm rifle stock assemblies. Marion, Ind. Springfield Armory, Springfield, Mass.

—Batesville Mfg. Co., Batesville, Ark. $4,083,460. Metal parts for the CBU 14A/A canister bomb unit. Batesville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—ACF Industries, St. Louis, Mo. $4,087,241. Metal parts for the CBU 14A/A canister bomb unit. St. Louis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Scovill Mfg. Co., Waterbury, Conn. $4,171,818. Metal parts for the CBU 14A/A canister bomb unit. Waterbury, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—National Lead Co., Toledo, Ohio. $1,514,699. Body assemblies for the CBU 14A/A canister bomb unit. Toledo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—National Lead Co., Pottstown, Pa. $1,427,318. Body assemblies for the CBU 14A/A canister bomb unit. Pottstown. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $1,407,356. Body assemblies for the CBU 14A/A canister bomb unit. Hopkins. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Bulova Watch Co., Jackson Heights, N.Y. $1,995,752. 2.75-inch rocket fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Fairchild Camera and Instrument Corp., Long Island, N.Y. $1,841,000. 2.75-inch rocket fuzes. Long Island. Ammunition Procurement & Supply Agency, Joliet, Ill.

—General Time Corp., Stamford, Conn. $1,152,360. 2.75-inch rocket fuzes. Stamford. Ammunition Procurement & Supply Agency, Joliet, Ill.

25—Martin-Marietta Corp., Orlando, Fla. $1,000,000. Exploratory development of selected Pershing components. Orlando. Army Missile Command, Huntsville, Ala.

—Saco-Lowell, Northeast Div., Maremont Corp., Saco, Maine. $1,964,098. Barrels for the 20mm, M61 and M61A1 Gatling Gun (Vulcan); and 1 set of final inspection equipment for the above barrels for use on aircraft machine guns. Saco. Army Weapons Command, Rock Island, Ill.

—Martin-Marietta Corp., Orlando, Fla. $14,600,000. Research and development of improved Pershing ground support equipment. Orlando. Army Missile Command, Huntsville, Ala.

26—Hercules, Inc., Wilmington, Del. $5,392,600. Propellants, explosives and O&MA activities. Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Mason & Hanger, Silas Mason Co., New York City, N.Y. $17,644,304. Loading, assembling and packing of artillery ammunition. Army Ammunition Plant, Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—U.S. Rubber Co., New York City, N.Y. $50,756,302. Ammunition, explosives and O&MA activities. Army Ammunition Plant, Joliet, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

27—Clark Equipment Co., Benton Harbor, Mich. $6,303,202. Industrial tractors. Benton Harbor. Army Mobility Equipment Command, St. Louis, Mo.

—American Cystoscope Makers, Inc., Pelham Manor, N.Y. $2,445,458. Telescopes, telescope equipment and hanger assemblies. Bronx, N.Y. Frankford Arsenal, Pa.

—Bell Helicopter Co., Fort Worth, Tex. $3,046,248. Main rotor hub assemblies for UH-1 aircraft. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—Bell Helicopter Co., Fort Worth, Tex. $1,021,623. Gear box assemblies for UH-1 aircraft. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—Hughes Aircraft, Fullerton, Calif. $1,750,000. Modernization program of the AN/TSQ-57 Fire Distribution System for the Marine Corps. Fullerton. Southwest Procurement Agency, Pasadena, Calif.

—Philco Corp., Philadelphia, Pa. $1,500,000. A voice access system and ancillary items. Willow Grove, and Philadelphia, Pa. Army Electronics Command, Fort Monmouth, N.J.

—Aerojet General Corp., Downey, Calif. $3,105,512. Cluster bombs. Camden, Ark. Edgewood Arsenal, Md.

28—A. G. Schoomaker Co., Sausalito, Calif. $1,198,193. Construction of the Meck Island land based power plant. Engineer Dist., Honolulu, Hawaii.

—Rohm & Haas Co., Philadelphia, Pa. $2,500,000. Propellant research program for one year. Huntsville, Ala. Army Missile Command, Huntsville, Ala.

—American Machine & Foundry Co., Brooklyn, N.Y. $3,351,841. Metal parts for 750-lb. bombs. Garden City, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Kennedy Van Saun Corp., Danville, Pa. $2,377,120. Metal parts for practice projectiles for the M60 tank. Danville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Aerojet General Corp., Downey, Calif. $1,629,900. Compontnts for bomb dispensers. Downey. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Avco Corp., Stratford, Conn. $7,153,000. T-53-L-15 aircraft engines for UH-1D helicopters. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—Avco Corp., Stratford, Conn. $2,400,000. T-53-L-15 turbine aircraft engines for the OV-1 aircraft (Mohawk); and T-53-L-11 engines for the UH-1E aircraft. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—Martin-Marietta Corp., Orlando, Fla. $1,690,928. Continued installation of modification kits in support of the Pershing weapons system. Orlando. Army Missile Command, Huntsville, Ala.

31—Hercules, Inc., Wilmington, Del. $7,218,425. 2.75-inch rocket propellant and O&MA activities. Sunflower Army Ammunition Plant, Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Scovill Mfg. Co., Waterbury, Conn. $1,727,765. Metal parts for bombs. Waterbury. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Merz Engineering Co., Indianapolis, Ind. $1,689,300. Bomb dispensers. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $1,315,280. Facilities necessary to expand production capability for fuzes and bomb cluster units. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Merz Engineering Co., Indianapolis, Ind. $1,706,639. Bomb dispensers and miscellaneous ancillary items. Indianapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Aerojet General, Downey, Calif. $1,810,162. Bomb dispensers and miscellaneous ancil-

lary items. Downey. Ammunition Procurement & Supply Agency, Joliet, Ill.
—General Motors, Detroit, Mich. $1,518,941. Diesel engines for the M113 family of vehicles. Detroit. Army Tank Automotive Center, Warren, Mich.
—General Motors, Indianapolis, Ind. $3,569,-198. Transmissions for the M551 General Sheridan tank. Indianapolis. Army Tank Automotive Center, Warren, Mich.
—Bowen McLaughlin York, York, Pa. $3,-952,410. Self-propelled 8-inch howitzers and recovery vehicles. Bair, Pa. Army Tank Automotive Center, Warren, Mich.
—FMC Corp., San Jose, Calif. $29,357,230. Armored personnel carriers, and cargo carriers. South Charleston, W. Va. Army Tank Automotive Center, Warren, Mich.
—Honeywell, Inc., Tampa, Fla. $2,500,000. Classified electronic equipment. Tampa. Army Electronics Command, Fort Monmouth, N.J.
—Collins Radio Co., Richardson, Tex. $3,-213,694. Radio terminal sets. Dallas, Tex. Army Electronics Command, Fort Monmouth, N.J.
—Magnavox Co., Fort Wayne, Ind. $1,705,-071. Components of vehicular communication sets. Fort Wayne. Army Electronics Command, Fort Monmouth, N.J.
—General Electric, West Lynn, Mass. $2,-350,000. T-64-GE engines for the advanced aerial fire support system. West Lynn. Army Aviation Materiel Command, St. Louis, Mo.
—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $17,242,932. Engines for the CH-54A aircraft (Flying Crane). East Hartford. Army Aviation Materiel Command, St. Louis, Mo.
—Watervliet Arsenal, N.Y. $5,417,430. 175mm cannons and barrel assemblies. Watervliet, N.Y. Army Weapons Command, Rock Island, Ill.

NAVY

3—Lockheed Missiles & Space Co., Sunnyvale, Calif. $29,261,444. Engineering services in support of the Polaris program. Sunnyvale. Special Project Office.
—Defoe Shipbuilding Co., Bay City, Mich. $11,764,280. Construction of two oceanographic research ships. Bay City. Naval Ship Systems Command.
—Bethlehem Steel Corp., Baltimore, Md. $1,-325,000. Overhaul of the landing ship, dock, USS CASA GRANDE (LSD-13). Baltimore. Industrial Manager, 5th Naval Dist.
—Sanders Associates, Inc., Nashua, N.H. $16,071,000. Classified electronic equipment. Nashua. Naval Air Systems Command.
4—United Aircraft, East Hartford, Conn. $1,607,794. Spare parts for engines for F-9F and F-8A aircraft. $9,970,987. Spare parts for TF-30-P6 engines for A-7A aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.
—General Dynamics Corp., Pomona, Calif. $3,727,166. Research and development of a new dual thrust rocket motor for the Standard missile. Pomona. Naval Ordnance Systems Command.
—Texas Instrument, Inc., Dallas, Tex. $2,-477,024. Components for the AN/AAPQ-116 radar system. Dallas. Naval Supply Systems Command.
6—LTV Aerospace Corp., Dallas, Tex. $18,-000,000. Services and materials to extend the service life and incorporate improvement changes in F8D aircraft. Dallas. Naval Air Systems Command.
—Alsco, Inc., St. Louis, Mo. $4,491,686. Rocket launchers. St. Louis. Naval Air Systems Command.
—General Dynamics, San Diego, Calif. $3,-000,000. Tracking radar modifications. San Diego. Naval Air Systems Command.
—Norris Industries ... Calif. $1.-

10—Sperry Rand Corp., Syosset, L.I., N.Y. $3,900,000. Instrument and control subsystems for the NR-1 vehicle. Syosset. Special Projects Office.
—United Aircraft, East Hartford, Conn. $3,203,400. TF-30-P-3 engines for the Air Force. East Hartford. Naval Air Systems Command.
—Columbia University, New York City, N.Y. $3,200,000. Research in acoustic detection. Dobbs Ferry, N.Y. Office of Naval Research, Washington, D.C.
—Jacksonville Shipyards, Charlestown, S.C. $1,526,000. Regular overhaul of the ammunition ship USS Wrangell (AE-12). Charleston. Industrial Manager, 6th Naval Dist.
12—United Aircraft, East Hartford, Conn. $5,-706,092. J52-P-8A engines. East Hartford. Naval Air Systems Command.
—General Electric, Cincinnati, Ohio. $1,604,-786. Spare parts for J79-GE-8 engines. Cincinnati. Navy Aviation Supply Office, Philadelphia, Pa.
13—Hughes Aircraft, Fullerton, Calif. $2,136,-636. Automatic Track-While-Scanning Radar System for the Barking Sands Missile Range at Kauai, Hawaii. Navy Purchasing Office, Washington, D.C.
—Kollmorgen Corp., Northampton, Mass. $1,820,700. Design, development and evaluation of a prototype periscope system for submarines. Northampton. Naval Ship Systems Command.
—General Electric, Cincinnati, Ohio. $4,989,-364. Design, development and evaluation of a prototype periscope system for submarines. Cincinnati. Naval Ship Systems Command.
—Itek Corp., Lexington, Mass. $1,918,665. Design, development and evaluation of a prototype periscope system for submarines. Burlington, Mass. Naval Ship Systems Command.
14—Litton Systems, Van Nuys, Calif. $3,529,-253. Spare parts for the AN/ASA-27 computer system for E-2A aircraft. Van Nuys. Naval Aviation Supply Office, Philadelphia, Pa.
17—Food Machinery Corp., Minneapolis, Minn. $3,832,000. Design & development of the 175mm, 60-cal. gun mount (Mk 1 Mod 00). Fridley, Minn. Naval Ordnance Systems Command.
—Akwa Downey Construction Co., Santa Barbara, Calif. $2,590,000. Construction of barracks at the Naval Training Center, San Diego, Calif. Southwest Div., Naval Facilities Engineering Command.
—Todd Shipyards, Brooklyn, N.Y. $1,127,926. Topside overhaul of the attack transport USS Monrovia (APA-31). Brooklyn. Industrial Manager, 5th Naval Dist.
—North American Aviation, Columbus, Ohio. $60,427,810. OV-10A aircraft for the Marine Corps and Air Force, plus long lead time effort for additional aircraft for the Marine Corps. Columbus. Naval Air Systems Command.
18—General Electric, West Lynn, Mass. $1,-847,210. Spare parts for T58-GE-8B helicopter engines. West Lynn. Navy Aviation Supply Office, Philadelphia, Pa.
—Standard Products Co., Cleveland, Ohio. $3,258,428. Track section repair kits for amphibious landing vehicles (LVTP-5). Port Clinton, Ohio. Marine Corps.
19—McDonnell Aircraft, St. Louis. $65,000,000. F-4J aircraft. St. Louis. Naval Air Systems Command.
—Bethlehem Steel Co., Baltimore, Md. $1,-186,557. Overhaul of the oiler USS Chikaskia (AO-54). Baltimore. Industrial Manager, 5th Naval Dist.
20—Westinghouse Electric Corp., Baltimore, Md. $66,379,000. Airborne radar receiver sets. Baltimore. Naval Air Systems Command.
—Douglas Aircraft, Long Beach, Calif. $31,-500,000. Increased long lead time effort for -4E aircraft. Long Beach. Naval Air Systems Command.
—United Aircraft, East Hartford, Conn. $14,469,019. J52-P-8A aircraft engines. East Hartford. Naval Air Systems Command.
—Pacific Coast Engineering Co., Alameda, Calif. $3,126,000. Construction of 6 cargo craft. Alameda. Naval Ship Systems Command.
—Todd Shipyards, Brooklyn, N.Y. $1,-132,163. Repairs, drydocking and installation of position keeping propulsion pods on the USNS Mission Capistrano (T-AG 162). Brooklyn. Military Sea Transportation Service, Atlantic Area.

21—Raytheon Co., Bedford, Mass. $10,642,... Research and development on the Sparrow guided missile. Bedford. Naval Air Systems Command.
—Intercontinental Mfg. Co. Garland, Tex. $5,244,000. Bomb bodies. Garland. Navy Ships Parts Control Center, Mechanicsburg, Pa.
—American Machine & Foundry Co., York, Pa. $6,849,750. Bomb bodies. York. Navy Ships Parts Control Center, Mechanicsburg, Pa.
—Todd Shipyards, Seattle, Wash. $1,149,... Regular overhaul of the attack transport USS Pickaway (APA-222). Seattle. Industrial Manager, 13th Naval Dist.
24—Levingston Shipbuilding Co., Orange, Tex. $8,587,000. Construction of two patrol escort (PF) vessels. Orange. Naval Ship Systems Command.
—Farmers Tool & Supply Corp., Denver, Colo. $1,873,274. Wing and rolleron assemblies for the Sidewinder 1C and Chaparral missiles. Indian Head, Md. Naval Propellant Plant, Indian Head, Md.
—Gunderson Bros. Engineering Corp., Portland, Ore. $4,259,145. Assault support patrol boats (ASPB). Portland. Naval Ship Systems Command.
25—Jacksonville Shipyards, Jacksonville, Fla. $1,250,000. Topside repair and alteration of the attack aircraft carrier USS Saratoga (CVA-60). Jacksonville. Industrial Manager, 6th Naval Dist.
—Todd Shipyards, San Pedro, Calif. $1,432,-636. Drydocking, alteration and repair of the attack cargo ship USS Skagit (AKA-105). San Pedro. Industrial Manager, 11th Naval Dist.
—M.I.T., Cambridge, Mass. $7,426,000. Design, development and testing of the Poseidon missile guidance system. Cambridge. Special Projects Office.
—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $13,857,652. J52-P-8A engines. East Hartford. Naval Air Systems Command.
26—National Steel & Shipbuilding Co., San Diego, Calif. $1,707,556. Regular overhaul of the attack transport USS Paul Revere (APA-248). San Diego. Industrial Manager, 11th Naval Dist.
—Douglas Aircraft, Long Beach, Calif. $2,-312,608. Bomb racks and adapter kits. Torrance, Calif. Naval Air Systems Command.
—Bendix Corp., Mishawaka, Ind. $15,026,-287. Talos guidance, control and airframe development. Mishawaka. Naval Ordnance Systems Command.
—United Aircraft, Pratt & Whitney Aircraft Div., East Hartford, Conn. $2,159,762. Spare parts to support engines on F9F, F8, A3, A4 and A6 aircraft. East Hartford. Naval Aviation Supply Office, Philadelphia, Pa.
27—Philco-Ford Corp., Aeronutronic Div., Newport Beach, Calif. $1,524,400. Armor plate for Navy boats. Newport Beach. Naval Ship Systems Command.
—Royal Industries, Engineered Products Div., Alhambra, Calif. $1,808,489. External auxiliary fuel tanks. Alhambra. Naval Air Systems Command.
28—A. C. Ball Co., San Carlos, Calif. $1,153,-106. Production of road wheel assemblies for Marine Corps amphibian tractors (LVTP-5). San Carlos. Marine Corps Supply Company, Philadelphia, Pa.
—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $1,500,000. Increased long lead time effort and materials for HH-53B helicopters for the Air Force. Stratford. Naval Air Systems Command.
—Bendix Corp., Eclipse-Pioneer Div., Teterboro, N.J. $6,392,332. Spare parts used in support of the PB20 automatic flight control system on attack aircraft. Teterboro, N.J. and North Hollywood, Calif. Naval Aviation Supply Office, Philadelphia, Pa.
31—General Electric, Washington, D.C. $2,-550,000. Reconditioning of 24 Government furnished turbine-generator sets, including voltage-regulation systems and spare parts. Fitchburg, Mass. Naval Ship Systems Command.
—Garrett Corp., AiResearch Mfg. Co., Los Angeles, Calif. $1,902,058. Compressor power units and related equipment. Torrance, Calif. Naval Air Systems Command.
—Curtiss Wright Corp., Wright Aeronautical Div., Wood-Ridge, N.J. $3,930,026. Spare parts to support J65W16 engines for various aircraft. Wood-Ridge. Naval Aviation Supply Office, Philadelphia, Pa.
—Collins Radio Co., Cedar Rapids, Iowa. $2,030,373. Design, development, fabrica-

tion, assembly and testing of a buoy subsystem. Cedar Rapids, Newport, Beach, Calif. and Richardson, Tex. Naval Ordnance Laboratory, Silver Spring, Md.
—Sperry Rand Corp., Univac Div., St. Paul, Minn. $1,777,500. Avionics computers. St. Paul. Naval Air Systems Command.
—Hayck Corp., Huntington Station, N.Y. $1,918,400 Ships' plotting systems. Huntington Station. Naval Ship Systems Command.
—LTV Aerospace Corp., Aeronautics Div., Dallas, Tex. $19,147,000. Non-recurring effort and long lead time material and effort in preparation for production of A7D aircraft for the Air Force. Dallas. Naval Air Systems Command.

AIR FORCE

3—Raytheon Co., Waltham, Mass. $1,035,000. Electron tubes. Waltham. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
—Atlantic Research Corp., Saugus, Calif. $3,301,542. Aircraft flares. Saugus. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
—North American Aviation, Anaheim, Calif. $1,361,611. Spare parts for the Minuteman weapon system. Anaheim. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
4—Walter Kidde & Co., Burbank, Calif. $1,-965,114. Modification of the personnel escape system of the F-102 aircraft. Burbank. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
—AVCO Corp., Everett, Mass. $1,000,000. Work on a research program. Everett. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
—United Aircraft, East Hartford, Conn. $2,287,207. Spare parts for J-57 aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
6—Olin Mathieson Chemical Corp., New York City, N.Y. $2,553,234. Production of fuel for TITAN missiles. Saltville, Va. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
—Consolidated Diesel Electric Co., Stamford, Conn. $1,764,259. Production of electrical generators and related equipment. Stockton, Calif. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
—Goodyear Aerospace Corp., Akron, Ohio. $6,650,000. Production of air transportable photographic laboratories. Akron. Aeronautical Systems Div. (AFSC), Wright-Patterson AFB, Ohio.
—Sperry Rand Corp., Charlottesville, Va. $1,770,504. Production of airborne radar for C-130 and C-141 aircraft. Charlottesville, Va. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Technical Measurement Corp., Santa Ana, Calif. $1,096,740. Production of telemetry display systems. Santa Ana. Air Force Western Test Range, Vandenberg AFB, Calif.
—Sargent Fletcher Co., El Monte, Calif. $7,814,815. Production of aircraft bombs. La Habra, Calif. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
—United Aircraft, East Hartford, Conn. $2,832,002. Production of spare parts for J-57 aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
—Fairchild Hiller Corp., Hagerstown, Md. $1,424,192. Production of aircraft fuel tank and ordnance pylon assemblies. Hagerstown. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
—General Motors, Indianapolis, Ind. $1,837,-020. Aircraft engine development work. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Continental Aviation and Engineering Corp., Detroit, Mich. $2,010,948. Production of J-69 aircraft engines. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Westinghouse Electric Corp., Baltimore, Md. $1,865,968. Production of communications equipment. Baltimore. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
1—Microwave Dynamics Corp., Mesa, Ariz. $1,500,000. Production of aircraft engine starter cartridges. Mesa. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
1—General Electric, Philadelphia, Pa. $6,-900,000. Mark 12 penetration aids system. Philadelphia. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
—Hughes Aircraft, Culver City, Calif. $3,-756,125. Production of modification kits and engineering services for Tactical Air Communications and Navigation (TACAN) systems. Los Angeles, Calif. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
Continental Aviation & Engineering Corp., Detroit, Mich. $1,486,020. Production of J-69 engines for T-37 aircraft. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
Cornell Aeronautical Laboratory, Buffalo, N.Y. $1,000,000. Analysis and evaluation of penetration aids. Buffalo. Systems Engineering Group, (AFSC), Wright-Patterson AFB, Ohio.
11 General Motors, Indianapolis, Ind. $2,-276,528. Component improvement program for the T-56 aircraft engine. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
Lockheed Aircraft, Marietta, Ga. $2,000,-000. Production of HC-130 aircraft. Marietta. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
Wilcox Electric Co., Kansas City, Mo. $2,-476,000. Production of aircraft communications equipment. Kansas City. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
12 Westinghouse Electric, Baltimore, Md. $1,-503,821. Production of communication equipment. Baltimore. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
Sperry Rand Corp., Univac Div., Washington, D.C. $2,522,040. Purchase of computer systems. Utica, N.Y. 2750th Air Base Wing, Wright-Patterson AFB, Ohio.
Bendix Corp., South Bend, Ind. $1,227,-345. Hydraulic assemblies for F-105 aircraft. South Bend. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
Curtiss-Wright Corp., East Peterson, N.J. $3,413,362. Production of a C-141 flight simulation trainer and related equipment. Paterson. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
13 Fairchild Hiller Corp., Bayshore, L.I., N.Y. $1,077,610. Production of environmental control systems for F-4, F-111 and F-105 aircraft. Bayshore. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
14 Aerojet-General Corp., Sacramento, Calif. $35,337,535. Production of Stage II Minuteman missile motors. Sacramento. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
17 Lear Siegler, Inc., Grand Rapids, Mich. $1,353,780. Aircraft bombing computers. Grand Rapids. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
United Aircraft, East Hartford, Conn. $1,123,536. Spare parts for R-4360 reciprocating aircraft engines. East Hartford. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.
19 General Electric, Philadelphia, Pa. $5,-699,971. Research and development on MARK 12 reentry programs. Philadelphia. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
Sargent-Fletcher Co., El Monte, Calif. $1,-070,920. Production of aircraft bombs. La Habra, Calif. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
A. G. Schoonmaker Co., Sausalito, Calif. $1,370,817. Production of heavy duty electrical generators. Sausalito. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
General Electric, West Lynn, Mass. $1,-762,000. Production of J85-GE-13 engines for F-5A aircraft. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
20 B. F. Goodrich Co., Akron, Ohio. $1,095,-730. Production of wheel assemblies for B-52 aircraft. Troy, Ohio. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
North American Aviation, Anaheim, Calif. $1,560,000. Maintenance and modification of Minuteman missile guidance and control equipment. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
American Electric, Inc., Paramount, Calif. $7,408,220. Production of aircraft bombs. Pittsburg and El Cajon, Calif. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
General Electric, Evendale, Ohio. $4,861,-360. Facilities expansion in support of the J-79 engine program. Evendale. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
21—Crane Co., Burbank, Calif. $1,790,000. Production of modification kits for the C-130 aircraft anti-skid brake system. Burbank. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
24—Sperry Rand Corp., Great Neck, N.Y. $1,-125,000. Ground support equipment for airborne LORAN navigational sets. Great Neck. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Thiokol Chemical Corp., Brigham, Utah. $1,076,507. Design, fabrication and testing of a thrust vector control system for a 156-inch solid rocket motor. Brigham. Air Force Flight Test Center, Edwards AFB, Calif.
25—L. T. Industries, Inc., Dallas, Tex. $3,230,-496. Production of aircraft bomblet dispensers. Dallas. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—North American Aviation, Los Angeles, Calif. $1,513,800. Production of radar equipment for F-100 aircraft. Los Angeles. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
—Martin-Marietta Corp., Denver, Colo. $2,-637,017. Production of spare parts for the Titan III missile system. Waterton, Colo. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.
26—Hughes Aircraft, Culver City, Calif. $2,-000,000. Training equipment and data related to the Falcon air-to-air missile. Culver City. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Continental Aviation & Engineering Corp., Detroit, Mich. $1,484,001. Production of J-69 engines for Army helicopters. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—General Electric, West Lynn, Mass. $1,-192,618. Spare parts for the B-52 hydraulic system. West Lynn. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.
—Columbia University, New York City, N.Y. $4,802,240. Studies of sensors applicable to ICBM trajectory. New York City. Air Force Office of Scientific Research.
27—Collins Pipe, Inc., and the Narwals Steel Co., Richmond, Va. $1,641,086. Production of metal revetments for aircraft protection. Richmond. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Batesville Mfg. Co., Camden, Ark. $2,-130,000. Production of dispensers for bomblets. Camden. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Dell Industries, Waycross, Ga. $1,278,355. Production of practice bombs. Waycross. Ogden Air Materiel Area, (AFLC), Hill AFB, Ga.
—Fairchild Hiller Corp., St. Augustine, Fla. $3,022,175. Inspection and repair of C-130, HC-130 and WC-130 aircraft. St. Petersburg, Fla. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.
—Systems Development Corp., Santa Monica, Calif. $2,000,000. Procurement of satellite control computer systems. Santa Monica. Air Force Satellite Control Facility, Los Angeles, Calif.
28—North American Aviation, Los Angeles, Calif. $4,711,114. Procurement of pylon assemblies for F-100 aircraft. Los Angeles. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.
—Sperry Rand Corp., Washington, D.C. $4,-290,565. Production of computer systems. Utica, N.Y. Wright-Patterson AFB, Ohio.
31—Boeing Co., Seattle, Wash. $5,500,000. Modification and updating of the Minuteman missile system. Cheyenne, Wyo.; Rapid City, S.D.; and Minot, N.D. Ballistic Systems Div., (AFSC), Norton AFB, Calif.
—Systems Development Corp., Santa Monica, Calif. $4,055,000. Computer programming services for the Air Defense system. Santa Monica. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass.
—Texas Instruments, Inc., Dallas, Tex. $1,-065,300. Production of spare parts for RF-4C aircraft. Dallas. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.
—Space Corp., Dallas, Tex. $1,579,087. Production of jet engine test stands. Garland, Tex. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

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University of Colorado Scientists To Investigate UFO Reports

The University of Colorado, Boulder, Colo., has been selected by the U. S. Air Force to conduct independent investigations into unidentified flying object (UFO) reports.

A research agreement, valued at approximately $300,000, is being negotiated with the university by the Air Force Office of Scientific Research to analyze phenomena associated with UFO sightings and to make recommendations on the Air Force's methods of investigating and evaluating UFO reports—a program known as Project Blue Book. A report is expected to be made to the Air Force in early 1968.

Dr. Edward U. Condon will direct the scientific phases of the work and Robert J. Low will serve as project coordinator. Principal investigators working with Dr. Condon will be Dr. Franklin E. Roach and Dr. Stuart W. Cook.

Colorado is expected to select several other universities to take part in the research. These and other consultants will bring the number of scientists involved to over 100.

The National Academy of Sciences has indicated its willingness to assist by appointing a panel—at the time the Colorado report becomes available to the Air Force—to review the investigating team's work. This panel will not be part of the investigating team, but will provide a further independent check on the scientific validity of the method of investigation.

Air Force Project Blue Book files, as well as any other UFO information in the possession of the Air Force, will be made available to the University of Colorado team. In addition, all Air Force installations within the United States will assist the team, if requested. The investigators will, however, conduct their research independently of and without direction from the Air Force.

The decision to enter into a research agreement for this work was based on a recommendation of the Air Force Scientific Advisory Board which completed a review of the resources, methods and findings of Project Blue Book earlier this year. The board recommended that the program be expanded to include investigation of selected sightings by independent scientists.

Within the Defense Department, the Air Force has the responsibility of investigating UFO reports in its role of air defense of the United States. The university's research does not alter the Air Force's responsibilities of receiving, investigating and evaluating UFO reports.

Army To Improve Pershing Missile System

The U. S. Army Missile Command has begun a program to improve the design and increase the rate of fire and reliability of its Pershing missile system.

Under the improvement program, known as Pershing 1A, ground support equipment used in the countdown and launch of the missile will take on a new look, but the 34-foot-long missile will remain unchanged.

The most noticeable outward change will be the shift from tracked to wheeled vehicles for transporting the missile system. Reason for the change is to reduce vibrations of equipment during cross-country movement and to reduce cost using the less expensive wheeled models which require less maintenance.

There will be four firing batteries in a Pershing 1A battalion. A battery will have several missiles, each on an improved erector-launcher mounted on a flatbed semi-trailer truck. The two solid propulsion stages and the guidance and control section will be carried fully assembled with the warhead section on the same vehicle. The improved programmer test station/power station, radio terminal set and new firing battery control center will be hauled on five-ton trucks.

Training Center for Retarded Gets Subcontract for Army Field Heater Kit Work

An employment training center for the mentally retarded has become a defense subcontractor through the efforts of the U.S. Army Tank-Automotive Center (ATAC), Warren, Mich.

New Horizons of Oakland County, Inc., located in Royal Oak, Mich., has been selected to package small components for Park Industries of Melvindale, Mich., as part of the firm's work on a $100,000 contract to produce field heater kits for ATAC.

A nationally recognized training institution for the mentally retarded, New Horizons contacted ATAC early this year for assistance in obtaining work for its trainees. All small business contracts let by ATAC after that time were screened in search of work which could be done at New Horizons.

Park Industries became interested in the project and worked out an agreement with New Horizons for packaging work as part of its ATAC contract.

New Horizons is a community organization devoted to the creation and operation of work-training centers for the mentally retarded of Oakland County, Mich.

During the 20 months it has been in operation, New Horizons has handled over $25,000 in contracts from business and industry. So far, 18 trainees have been placed in full-time employment with private companies, using the skills they learned at New Horizons.

University of Illinois Site for Army Engineer Construction Research Lab

The University of Illinois has been selected as the site of a new construction engineering research laboratory to be operated by the Army Corps of Engineers. Selection of Illinois was made after study of proposals made by 20 engineering schools and universities in response to an invitation by the Corps of Engineers.

The new facility will be constructed by the University of Illinois and leased to the Corps of Engineers which will operate it. The laboratory is expected to begin operations in mid-1968. Its annual budget will be about $3.5 million.

Planning for the establishment of the laboratory began a year ago when it was determined that construction research requirements exceeded capabilities of the Corps' existing laboratories. Rapid advances in technology and more stringent demands for performance of facilities required for construction present problems requiring increased construction research.

Broad areas of research to be carried out by the new laboratory include studying ways to speed the application of the latest construction technology, developing more progressive construction policies and procedures, and seeking methods for developing and carrying out long-range construction research programs. Investigations will embrace such diverse areas of study as testing techniques, environmental control, hardened power plant construction, and research in enhancing the esthetic values of structures and preserving natural beauty with man-made design.

A committee of specialists from the Building Research Advisory Board, under a contract with the National Academy of Sciences, is assisting the Corps in planning its long-range construction research program.

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

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Management Systems for Package Procurement

by
Lt. Gen. W. A. Davis, USAF

The Total Package Concept (TPC) is likely to be applied to a large number of select programs in the years ahead and will have certain impacts on present Air Force and other Government agency management systems. Thus TPC needs to be clearly understood not only by military managers but throughout industry.

TPC, as conceived by the Air Force, envisions that all anticipated development, production, and as much support of a system as is feasible throughout its anticipated life, is to be procured as one total package and incorporated into one contract containing price and performance commitments at the outset of the acquisition phase of a system procurement.

Stated simply, TPC looks at the procurement process in the same way that the Air Force has long looked at a given major system—as a total package rather than as a series of "black boxes" or as a sequence of relatively independent stages. In fact, our ability to apply TPC stems from the fact that we have been managing systems programs as total systems for many years.

TPC requires at least two basic conditions:

- It must be possible to define the performance requirements for a given system in detail and with a high degree of accuracy.
- The major technology needed must be in hand.

TPC calls for a straightforward job of engineering development. If the system cannot be defined with a high degree of detailed accuracy, a sufficiently definitized contract for TPC cannot be developed. Moreover, if the technology is not substantially in hand, the risk is simply too great to allow for a fixed price. If a fixed price is not obtainable, TPC cannot be applied and, as a result, there is no total package procurement.

The C-5A, which met the criteria, was the first procurement under TPC. It has been estimated that as much as 90 percent of the program for the first seven years is being bought under a single binding fixed-price incentive contract. The contract covers all the engineering development and production of the system including support such as ground equipment, spares, training devices and contractor technical support. A very important fact is that the single contract contains price, performance and schedule commitments for the whole system from the start of acquisition.

Under the stage-by-stage, or sequential, method of procurement we generally start by buying only about 20 to 25 percent of a program—the development portion. Then follow-on production contracts are awarded for training, spares, etc. This approach has been dictated by a number of large systems programs in which detailed definition was not possible in the early stages, where technology was not in hand, and where the risk was simply too great.

Under the sequential approach there is the hazard of so-called "iceberg procurement." Simply stated, when we initially contract for the development program, we are buying only the top of the iceberg. Then we may find that we are in a sole-source position with the development contractor for follow-on, or the underwater portion of the iceberg.

Lt. Gen. W. A. Davis, USAF, is Vice Commander of the Air Force Systems Command, Andrews AFB, Washington, D. C. He has held prior assignments in AFSC as Commander, Aeronautical Systems Div., 1961–1962; and as Commander, Ballistic Systems Div., 1962–1964.

This means that there is real competition for a relatively small portion of the program. In the case of some of our past programs this had tended to prompt unrealistic estimates during the early competition. There is ample evidence that, during some development competitions, contractors have tended to overstate estimates for performance and understate probable costs. The estimates for final production systems have also tended to be optimistic. Estimates of this kind have generally been budgetary estimates that are not contractually binding.

The bulk of these optimistic estimates have been due to a lack of adequate definition or the right kind of data, but some of the optimism has been the product of a deliberate effort to "buy-in."

One point should be made very clear. The sequential method has worked well in the past and, of necessity, will be applied to programs in the future. In some cases, it is the only avenue open to us. Careful negotiation, competent exercise of management control, and constant vigil can largely overcome the hazards involved.

TPC represents another and a very effective way to overcome the hazards—where it can be applied. It is a very good approach to reduce program cost and schedule overruns. The following measures are applied under TPC:

- Competition is broadened to cover the entire system package and not just the initial stages.
- Discipline in the areas of definition and estimating are greatly tightened during competition.
- A fixed price is established during competition which becomes binding on the selected contractor.

These measures could lead to some real savings in programs where they can be applied. They should definitely result in fewer surprises in terms of overruns.

It is true that TPC provides a solution to the problems of iceberg procurement. However, TPC also raises some problems, namely:

- The problem of "disengagement." This term simply means the degree to which the military divorces itself from detailed management.
- The problem of inhibited technological innovation.

The problem of disengagement is especially thorny. We recognized this when we embraced incentive contracting many years ago. The problem becomes more acute under TPC. On the one side, under TPC contractors must have essentially a free hand. On the other side, the military cannot abrogate completely its responsibilities. It is true that a contractor may go broke if he fails to meet his downstream contractual commitments. This would be no consolation to the military if the system ordered simply did not meet the established requirements. This could have a grave impact on national security.

So we cannot say to a contractor, "Well, here is the contract. Come back to us in five years or so with the product, and good luck." Instead, we will be looking over the contractor's shoulder and will insist on ample visibility so that we can step in if necessary. This is the keystone to a management system for total package procurement—the ability to step in if needed instead of day-to-day participation in detailed management.

There has been some misunderstanding on this point. Disengagement does not mean that the military or Government agency gives up control. It simply means that we do not get involved in detailed management unless we have to. We will monitor very closely, we will step in if we have to, and we will retain the right of control.

Therefore, the problem of disengagement imposes some questions that we must continually ask ourselves:

- On a given program, how much control do we turn over to the contractor?
- How closely do we monitor?
- At what point do we step in? What are the consequences? What penalties are involved for industry or for the Government?
- What price do we pay if we do not step in at a given point?

Where TPC is concerned, I think everyone would agree that the military should not exercise control unless that action is required to achieve military requirements and objectives

... make sure that all our approaches are integrated, a Management Systems Control Board has been organized at Air Force Systems Command (AFSC) headquarters under the chairmanship of the Vice Commander. The primary role of the board is to insure that a disciplined method is established for the evolution and systematic development of AFSC management systems and policy.

This applies especially to those procedures that cut across functional lines and impact on the contractor's internal management activities. A specific objective of the board is "to address the questions of disengagement and visibility."

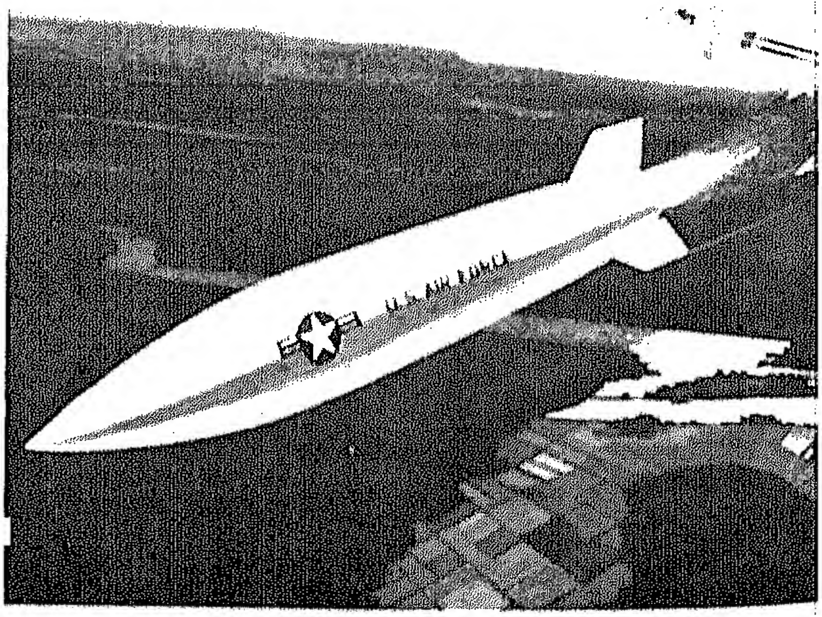
The other problem raised by TPC, as previously stated, is that of inhibited technological innovation. When a system is bought at a fixed price under TPC, there is a tendency to freeze technology at the current state of the art. In such a situation, downstream we get essentially what was bought years earlier, probably incorporating very few, if any, significant technological advances achieved after the original contract was signed. The contractor is not motivated to include, or aggressively pursue, technological innovations that would improve the system if such an improvement would result in increased costs.

This is a significant problem and there are no short and simple solutions. It is true that TPC will inhibit change for the sake of change. It also insures that changes, which are designed simply to bring the sys up to the point where the contra promised it would be in the first pl are within the scope of the contr This does not prevent the custo from accepting changes that w greatly improve the system. The remains that technological innovat which might greatly enhance value of a given system beyond original specifications, is inhibite some extent.

We will need to give a great more attention to this problem ways to overcome it. We are work in this direction and eventually sho find the answer for which we looking.

Clearly, TPC has a number of s cific impacts for both military and dustry management:

- The military must be able to fine more precisely what it wants the outset.
- Industry must be able to def more completely what it will deli for a price.
- Industry must be concerned fr the start with design for economi production, value engineering duri design, reliability, and simplicity maintenance to design accurat the first time. This is a task which industry is uniquely quali just as the military is uniquely qu fied to define operational requireme
- More of the detailed mana



Artist's concept of the AGM-69A Short Range Attack Missile (SRAM). T SRAM will be acquired under the total package concept.

ment decisions are shifted to industry. Industry managers have the burden of getting the necessary quality at the lowest possible cost. This means that industry, rather than the military or Government agency involved, will be increasingly concerned with the need to obtain supplies and services from the most efficient sources.

• Both military and industry management will need to find imaginative new ways to encourage and stimulate technological innovation.

These are some of the key implications of TPC for management. There might be a tendency to think that the application of TPC calls for some radical changes in our management methods. This is not really the case, although some changes are called for and are being made.

The fact is that the concepts of total system management and of total package procurement are largely compatible. A prerequisite for TPC is the ability to manage systems as total systems. A prime requisite to good system management is flexibility of the management system. Under the formal Air Force management disciplines, we can manage a total system in-house in great detail, or we can manage in relative detail "over-the-shoulder" of major contractor, or we can disengage from detailed management at any point and to the degree that seems appropriate.

The reason this is not always readily appreciated is that some people tend to look at all of our formal management documents as hard-and-fast procedures. Actually, there is nothing static about them. They are guidelines that may be used in a number of different ways.

While there may be a number of refinements to formal Air Force procedures—and, incidentally, these will not be exclusively the result of TPC—there are likely to be few, if any, drastic changes.

In the Air Force we are currently looking closely at all of our procedures with a view toward their further improvement. In AFSC Manual 375-1, dealing with configuration management, we are assuring that our policy is clear and procedures flexible enough to properly align authority and responsibility with respect to change decisions.

We are also reviewing the instructions in our 375 series manuals for preparation of hardware specifications to assure their support of TPC procurements. There must be no confusion as to the quality, scope and specific definition of contract performance requirements and the test and quality assurance associated with these requirements.

In AFSC Manual 375-5, dealing with system engineering management procedures, the Air Force will provide specific instructions to tailor system engineering requirements to TPC procurement. For example, the present manual suggests a requirement for approval of detailed contractor design decisions. The inconsistency of this requirement and TPC objectives is recognized.

We are also insuring that the 375-5 manual can at least be used as a guide for engineering or management rather than a rigorous contract requirement.

We are taking a hard look at our data reporting requirements. We learned in the C-5A program that the unusual definition requirements of TPC during competition may produce vast volumes of data, the requirement for which is suspect. In fact, the five contractors together submitted a total mass of data that weighed over 35 tons. One contractor filled an entire aircraft with data and flew it to Dayton, Ohio, for evaluation. Over 400 people spent two and one-half months—a total of 132,000 manhours—reading and evaluating the proposals. Our review indicates that our total data requirements could be drastically reduced.

In Air Force Systems Command/Air Force Logistics Command Manual 310-1, dealing with data management, we are reconstructing many of our data items so they may be used selectively either for control under high risk cost-plus-fixed-fee contracts or for visibility under fixed-price contracts.

This is just a sampling of the continuing efforts not only to align our management procedures for TPC, but also to improve them generally. Many of the actions that have bearing on TPC were started before TPC was applied.

For example, the Air Force has had a formal cost management improvement program since July 1964. The purpose of the program has been to improve financial management of systems programs and to reduce the amount of data needed to do the job. Basically, what we have done is to establish standard data reporting criteria. We have not attempted to impose a single financial management and data collection system. We expect the contractor to build his own financial management system and we ask only that he meet our reporting criteria.

The criteria have been published in a Cost/Schedule Planning and Control Specification. The specification is a contractual requirement on the C-5A, F-111, Manned Orbiting Laboratory (MOL), and Short Range Attack Missile (SRAM) programs, which is a good indication of the flexibility of the concept. One result is that a specific financial management system, designed exclusively for total package procurement, has not been required.

Some important benefits to this approach are:

• Individual contractors will receive only one kind of demand for financial management information from system program directors, whether or not TPC is applied.

• The use of the same data by both the contractor and the system program director for management of the program will greatly improve accuracy and reliability.

• A valid base is established for effective response to management information requirements of Headquarters, U.S. Air Force, and DOD, with minimum impact on contractor operations.

To sum up briefly, TPC does have some significant impacts on our management systems. These impacts tend to be more on how our management systems are used rather than on their actual structure. It is reasonable to draw at least four basic conclusions:

• TPC must be applied on a selective basis not only where whole programs are concerned, but also where certain portions of given programs are concerned.

• TPC requires careful structuring of incentives in order to assure achievement of program objectives and to offset the inhibition of technological innovations.

• TPC requires unique recognition of contractor cost risks.

• TPC is well within our management state of the art, but it highlights the need for better understanding of the flexibility of our management systems and realism in their application.

The Impact of Vietnam on the Army RDT&E Communications-Electronics Effort

by
Lt. Gen. A. W. Betts, USA
Chief of Research and Development
Office of Chief of Staff, U. S. Army

In 1962 the Army underwent a major reorganization, particularly as far as the processes for determining future materiel requirements and the research, development, procurement, supply and maintenance of materiel (Figure 1). The processes of determining how the Army of the future should be equipped, how it should be organized, and how it would fight were elevated into a consolidated and separate major field command the U. S. Army Combat Developments Command (CDC). Concurrently, the majority of the old individual Technical Services of many years standing were abolished in favor of a consolidated command structure which was more functionally oriented. From this reorganization came the U. S. Army Materiel Command (AMC). With the establishment of these new major commands the Army was following a course of continuing management improvement and evolution.

Also, until the 1960's, the principal threat to the United States and the Free World was interpreted in the form of overt massive formal military action. As such, the materiel requirements, which were in the Army's research and development stream, were being developed in response to this threat. However, with the recognition that the covert threat—the limited war, the so-called war of national liberation—was to pose a growing commination, the Army responded to the changing of additional materiel requirements imposed by this threat.

One of the first steps was the establishment of the U. S. Army Limited War Laboratory (LWL) at Aberdeen, Md. (Figure 2). The mission and purpose of this organization are to provide a quick-reaction facility for the development of specialized limited war items—relatively small pieces of equipment—the need for which arose from experience and study in combatting the lower ends of the conflict scale. This laboratory is item oriented rather than system oriented. Quite often the solution reached by the LWL staff to a problem is a modification to existing off-the-shelf commercial equipment.

About the time that the laboratory became operational, U. S. involvement in Southeast Asia was largely in the advisor role with Special Forces teams operating over wide parts of Vietnam. From their experience came a Combat Developments Command Special Forces Communications Study completed in June 1963.

The purpose of this special study project was to determine user requirements for man-pack jungle communications, the adequacy of current equipment in the field of jungle communications, changes in techniques and concepts of employment to increase the efficiency of current equipment in the jungle, and the availability of commercial equipment to provide interim solutions to jungle communications problems.

As a result, the Army staff directed AMC to implement the recommendations of this study. The recommendations included the modification of existing sets such as the AN/GRC-87, the issue of a U. S. Marine Corps AN/PRC-41, the procurement of commercial equipment for evaluation such as the HC-162, Gonsett and Skycrafter ground to air units. At the same time development of equipment continued to meet current approved Army statements of materiel requirements.

Several items have been developed, or are being developed, to meet Special Forces requirements. As might be expected, the Special Forces requirements are similar to those of jungle communications. The base station for Special Forces, providing long range communications with outstations, was developed for Special Forces use and has been shipped to Vietnam. The AN/PRC-64, an LWL development, is in use as a lightweight patrol set for Special Forces. In general, Special Forces requirements applicable to jungle communications have preceded those of conventional forces.

There was still another major action under way at this time which would also have repercussions on the

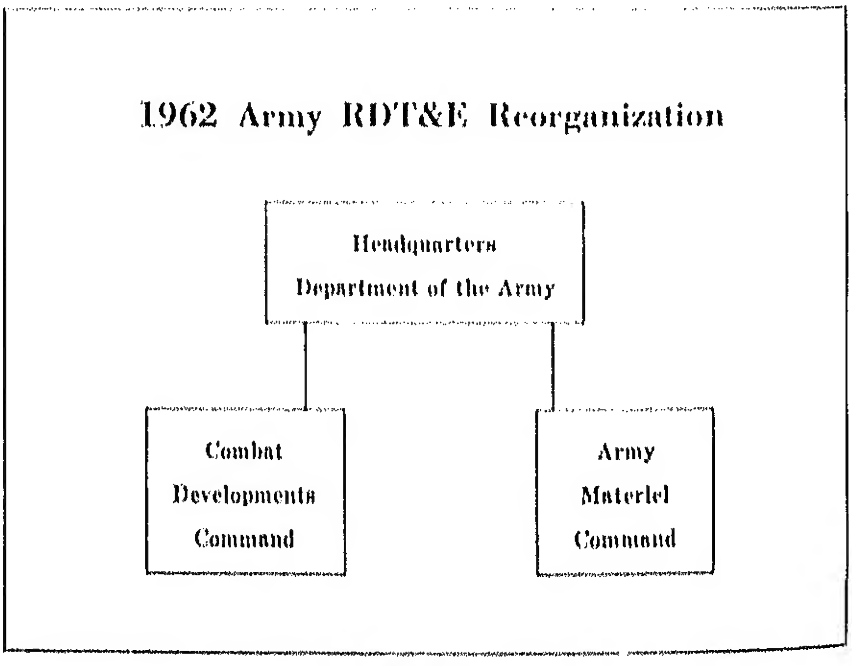


Figure 1.

Army's electronics program, and this was the testing of the air mobile concept. This concept was tested by the 11th Air Assault Division at Fort Benning, Ga., and, upon the successful completion of the test program, the unit was reorganized and redesignated the 1st Cavalry Division (Airmobile).

During the initial test program the 11th Air Assault Division installed a number of standard communications equipments in one-quarter-ton trucks in order to facilitate their movement by helicopter. Most of this equipment was taken to Vietnam by the 1st Cavalry Division (Airmobile) and has been used with success. Additional items were procured commercially and, where satisfactory, were retained by the division. Included were items of radio relay and radio terminal equipment such as the AN/MRC-112 composed of the AN/GRC-10 radio and AN/TCC-3 multiplexer. The requirements for lightweight equipments for airmobile use developed by the 11th Air Assault Division have proved to be those of other units operating in Vietnam as well.

With the increased tempo and involvement of U. S. Army units in the Vietnam action, there has been a renewed awareness for the need of improved performance and reliability while reducing the size of communications-electronics equipment. In addition, the U. S. Military Assistance Command-Vietnam and the U. S. Army-Vietnam have shown increasing interest in filling technological gaps and are asking for more modern equipment. A number of actions have been taken to respond to Vietnam requirements as rapidly as possible. These actions include modifying the procedure for establishing requirements to allow the Office of the Chief of Research and Development to initiate development of an item upon validation of a request from Vietnam, limited-production type classification to reduce administrative time, sole-source procurement to accelerate contract award, and quick-reaction fabrication at Army Depots.

An example of Army Research, Development, Test and Evaluation (RDT&E) action for Vietnam in response to these conditions is the expedited development of the forward-area PPS-5 surveillance radar. A 360-degree countermortar radar is also receiving expedited attention.

Looking at the matter from another angle, just what have been some specific effects of Vietnam RDT&E needs on the normal requirements/RDT&E process? The first answer is that we have found the normal system a little too slow and formal for many of the requirements emerging from Vietnam. This has resulted in two programs: Project PROVOST (Priority Research and Development Objectives to Support Vietnam Objectives) and the ENSURE process.

Project PROVOST was initiated in August 1965. It began with an estimate of weapons and equipment that could be made available in the near future, programs or developments the Army felt should be accelerated, and new programs that should be started in the light of Vietnam requirements. As a result numerous projects were selected for accelerated effort in FY 1966 and financed by approximately \$14.6 million in emergency funds and \$28 million in supplemental appropriations. Included in the list were a variety of surveillance devices, weapons, munitions and personal equipment. This effort is being continued.

In addition, special procedures have been established to expedite requirements for development or procurement of materiel items that are not available in the Army inventory. These are items which are urgently needed to provide a new or improved operational capability and of a nature which permits development or procurement in sufficient time to support the stated requirement. This is the so-called ENSURE process. In effect, what ENSURE does, so far as the research and development aspect is concerned, is to permit the requirement from the field to come directly to the Department of the Army—specifically the Assistant Chief of Staff for Force Development (ACSFOR)—rather than to CDC. Naturally, information copies of such undertakings are provided to CDC. ACSFOR screens the requirement to determine its validity and the appropriate General Staff agency responsible for approval, and initiates action to develop or procure those items within the purview of ACSFOR.

Here a word of caution should be injected! Too many shortcomings in raw material reaching the field have been coming to light, particularly in the old reliability and maintainability areas. Part of the solution to this problem, the Army believes, may rest in our current test and evaluation process and, because of this, the Army is now reviewing its entire process. It will certainly result in an increased emphasis on this phase of research and development, particularly those areas mentioned—realiability and maintainability demonstrations during and at the conclusion of the development programs as well as for

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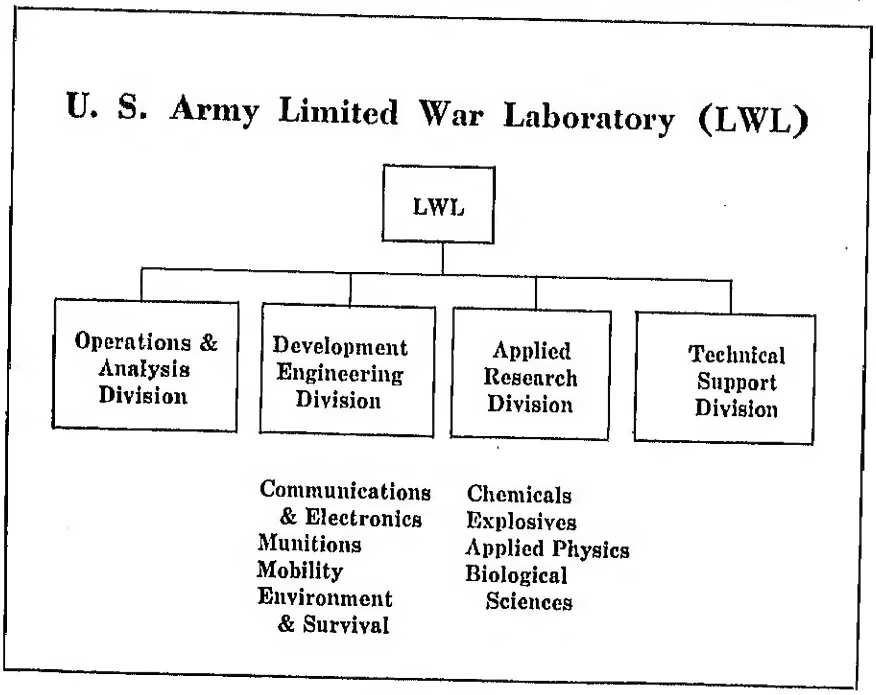


Figure 2.

The Navy's Deep Submergence Systems Project

by
Dr. John P. Craven

The U.S. Navy has long been interested in oceanographic research and has been able to accumulate a considerable store of information about the topography of the ocean floor; marine animal and plant life; the chemistry of the seas; and the effect of sea, air and land on nature's most basic functions.

Over the years some knowledge has been gained about the continental shelves which slope away from our shores for a distance of from 10 to 200 miles. But most of the 140 million square miles of the ocean floor remain uncharted. Our best information, until recently, has been obtained by accoustic sounding. Use of the deep-diving bathyscaph, Trieste, was the first successful attempt by the Navy to obtain information first hand from the depths of the ocean. Our ability to work at deep levels is still quite limited.

The lack of U.S. capability for deep sea exploration and its collateral benefit, deep ocean rescue, was painfully apparent when the submarine USS Thresher sank in more than 8,000 feet of water in April 1963. It was this accident which triggered the Deep Submergence Systems Review Group and set the stage for a comprehensive effort by the Navy in the deep ocean.

The Deep Submergence Systems Review Group.

The Deep Submergence Systems Review Group, under the chairmanship of Rear Admiral E. C. Stephen, USN (Ret.), was given responsibility for a comprehensive review of the Department of the Navy plans for location, identification, rescue from and recovery of deeply submerged objects from the ocean floor; for recommending changes in such plans to provide both expeditious and long-term improvements; and for developing a five-year deep submergence program for the Navy. The major goal of the review group was to recommend reliable systems for recovery of both men and objects from the ocean.

The study illustrated two important facts to the group. First, the Navy could not recover lost items by dangling hooks at them from two miles above. Second, rescue missions cannot wait weeks or months until weather conditions are satisfactory for operations.

All of today's methods have their limitations. The Trieste is more suitable than other systems, but even it falls far short of the mark. Trieste is surface based, has a limited horizontal cruising range, and is capable of performing only very light work while on the bottom.

The Deep Submergence Systems Project.

On May 28, 1964, Secretary of the Navy Paul H. Nitze announced that he had accepted the report of the Deep Submergence Systems Review Group and had assigned implementation of a Deep Submergence Program to the Navy's Special Projects Office under the Chief of Naval Material in accordance with the latter's recommendation.

Assignment of the Deep Submergence Systems Project (DSSP) to the Special Projects Office reflected the importance which the Navy attached to it.

Important also, in the assignment of DSSP to the Special Projects Office, was the need to insure proper coordination with the many other organizations which have program responsibilities or vital interests in ocean engineering.

Dr. John P. Craven is Project Manager of the Deep Submergence Systems Project of the Department of the Navy. He also serves as Chief Scientist of the Navy's Special Project Office, a position he has held since 1959.

On May 26, 1966, after nearly two years under the management of the Navy's Special Projects Office, DSSP was officially established as a Navy field activity and a separate project under the Chief of Naval Material. During this period the program gained substantial momentum. Together with its national significance, complexity, and broad development potential, intensified management and focus of effort was required. As a designated project, DSSP will create an environment in which a program visibility will be established and which will provide, on a continuing basis, the attention of top Navy management.

Within the broad scope of various Navy ocean science programs, DSSP has been assigned primary responsibility for directing, coordinating and programming a substantial portion of ocean engineering research and development funds within DOD. The magnitude of the program is noted in its funding level of about $300 million dollars spread over the 1966-1972 time span.

Although the overall program is clearly Navy oriented, it should be recognized that the techniques and basic principles acquired in developing military ocean engineering capabilities can be equally applied to commercial and other multi-purpose civilian programs.

The broadest Navy objective in supporting ocean science technology is to gain knowledge in order to operate throughout the ocean volume, and the DSSP program elements deal with the following specific areas:

- Submarine Location, Escape and Rescue.
- Object Location and Small Object Recovery.
- Man-in-the-Sea.
- Large Object Salvage.
- Nuclear Powered, Deep Submergence, Research and Ocean Engineering Vehicle (NR-1).

Submarine Location, Escape, Rescue.

- **Location:** The objective is to achieve a capability to locate a distressed submarine and determine the cause and nature of disablement.
- **Escape:** A program to improve present submarine and undersea vehicle escape capability is planned

which includes immersion suits and one-man life rafts to increase survival possibilities of escaping personnel.

• Rescue: A new system is planned to permit the rescue of surviving submarine personnel under all-weather conditions, under ice, and at depths as great as present submarine collapse depths. This system will consist of three units of rescue submersible vehicles, each unit to be comprised of two vehicles. These vehicles will be air transportable to provide rapid response to an undersea disaster anywhere in the world. They will be carried to the scene of operations "piggyback" aboard a nuclear submarine or aboard a specially designed surface ship. The vehicles will be constructed to operate at a maximum depth consistent with technology and cost constraints. Each will have a crew of two operators and two medical corpsmen and will be capable of transferring 24 survivors on each trip from the disabled submarine to the mother submarine.

Lockheed Missiles and Space Company of Sunnyvale, Calif., has been competitively selected to design and construct the prototype rescue vehicle. Operator and maintenance crew training is to be started during 1966–1967.

Object Location and Small Object Recovery.

More than 80 percent of the ocean volume lies below present Navy operating capabilities. A system is needed to permit surveys, investigations and recovery of small objects, such as ordnance and small parts of ships from depths up to 20,000 feet. A search test vehicle will be designed to evaluate new materials and equipment. In addition, a deep sea test range will be developed to test concepts and vehicles equipment and systems under controlled and monitored conditions. This range will provide services for all elements of the project. Research will also be conducted on material problems associated with 20,000-foot depth vehicles.

Man-in-the-Sea.

This system's objective is to provide a capability for support of rescue and salvage operations, maintenance of bottom-mounted equipment, exploration and exploitation of the continental shelf, and possible assistance in military operations associated, for example, with mine defense and amphibious assaults. Emphasis will be on the adaption of men to the deep sea environment at ambient pressure for the particular depths of operations. The program will also increase the effectiveness of all other DSSP systems. Man-in-the-Sea will involve:

• Mobile pressure equipment development needed for decompression.

• Physiological research and experimentation.

• Surface ship modifications to support diving operations.

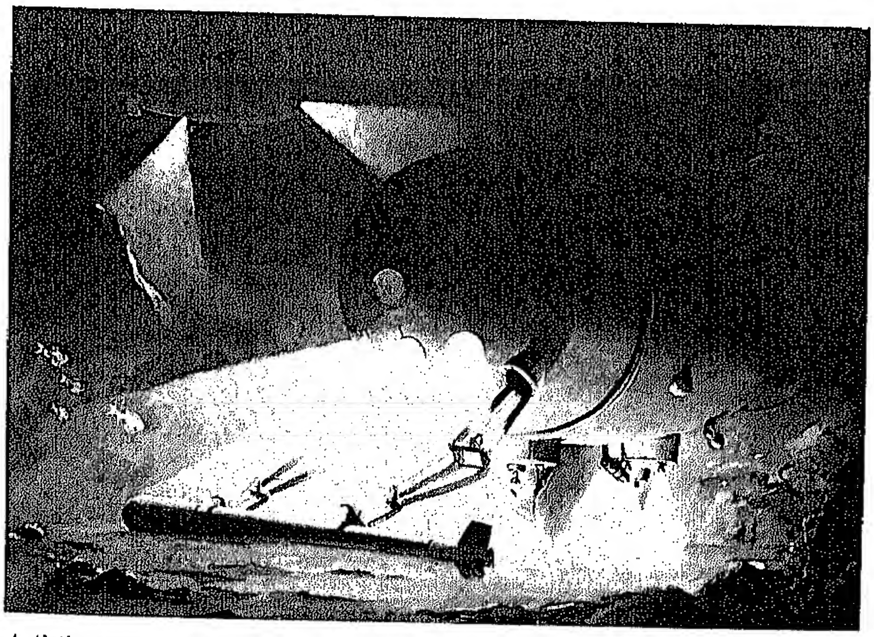
• Advanced sea habitations to provide underwater living and storage facilities to future aquanauts.

• Development of auxiliary items such as diver-to-diver communications, and improved underwater propulsion devices.

In addition, an advanced development objective exists for extension of man-in-the-sea technology, first to depths below the continental shelf and ultimately down to the physiological limits of man. Initially, one advanced sea habitation and its auxiliary equipment will be established on the continental shelf. Divers will then be able to operate from this shelf for a month or more without coming to the surface. A continuation of the SEALAB experiments is scheduled during the latter part of 1967 to obtain data necessary for deeper depth operations.

The next experiment, to be known as SEALAB III, will extend the depth to the 400-500-foot level in the waters off the coast of San Clemente Island, Calif. Three to four teams of six to eight divers will live in the ocean-bottom habitat for 15-day periods.

To prepare for the program, refurbishment and implementation of earlier SEALAB equipment is being started. In addition, coordination with other branches of the Navy has been effected to obtain data for the biomedical, physiological and hydrobiological tests to be studied during the open-sea experiment.



Artist's concept of the U. S. Navy's 20,000-foot Search and Small Object Recovery Vehicle.

Large Object Salvage.

This system's objective is to provide the capability to recover large objects —sunken ships—of a deadweight lift of 1,000 tons from depths up to 850 feet. To accomplish this mission, external lift will be supplied by collapsible pontoons with a combined bouyancy of up to 1,000 tons. Underwater work will be accomplished by divers equipped with appropriate tools and devices, possibly including manned vehicles. The medical and physiological reasearch and development required for safely conducting deep-diving work will be provided by the Man-in-the-Sea program. In addition, feasibility studies and prototype development will be conducted to resolve the problems associated with salvage operations at submarine collapse depth.

Buoyancy materials will be developed to lighten objects and for exert-

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The Electromagnetic Compatibility Requirement

by

John J. O'Neil

The following excerpt from a memorandum from the Office of the Secretary of Defense to the Secretaries of the Army, Navy and Air Force summarizes the electromagnetic compatibility problem confronting the Defense Department and the action taken to cope with it:

> "The increasing use of the radio frequency spectrum and greater reliance on radiating devices for military purposes is resulting in a radio frequency interference problem that is of great concern. . . . A comprehensive program is hereby established to cope with radio interference between electronic equipments and systems and particularly to ensure that, to the maximum practicable extent, electronic systems will not suffer operational degradation due to the absence of appropriate means for rejecting interference and for achieving radio frequency compatibility."

At the time of its issuance in 1960 the three Services had in being research and development programs in the interference reduction area. However, the directive gave high level support and added impetus to these programs and resulted in the first coordinated tri-Service frontal attack on a problem which dates back to the very earliest days of radio transmission and reception. Why this sudden interest at the highest DOD echelons? A review of the growth in the use of electronic equipments in the field army is one answer.

For example, the number of radio transmitters used by the field army in 1918 was between 200-300. During World War II there was a constant increase in the use of electronic equipments until at the end of hostilities our field armies were using about 20,000 radiating devices. Since World War II there has been a phenomenal growth in the use of electronics by the Army because of its need for highly mobile communications, surveillance, air defense and air traffic control.

Analysis of the electromagnetic environment of the future field army indicates a minimum of 70,000 equipments, radiating rf energy over a spectrum of at least 150 KHz to 10 GHz, will be required to carry out its mission in the desired manner. This estimate does not include the extremely low-power transmitters, nor the hundreds of thousands of unintentional emitters of interference such as vehicles, generators, motors, etc. Further, this figure is only for one field army. When the requirements of the Air Force, Navy and Marine Corps, in addition to adjacent field armies in the event of a world-wide conflict are considered, the figure becomes astronomical. Unless the design and use of these equipments is carefully controlled, the same chaotic effect as a profound enemy jamming program could result.

Definition.

What is this rather intangible requirement referred to as electromagnetic compatibility? The Department of the Army defines it as "the capability of communications-electronics equipments or systems to function in their intended operational electromagnetic environment without undergoing performance degradation below acceptable limits due to unintentional interference, or without causing unacceptable performance degradation to other equipments and systems due to spurious, harmonic, or other unwanted emanations." It includes, but is not limited to, electromagnetic interference control which may be defined as "the adequate reduction of steady state or transient electromagnetic energy which may cause undesirable response or otherwise impair the operation of electrical or electronic equipment." Thus it is apparent that electromagnetic compatibility can be achieved in a field army only when a vigorous program of interference control is in existence.

USAECOM Program.

The U.S. Army Electronics Command (USAECOM) has as one of its functions research and development leading to economical, reliable electromagnetic interference reduction control circuitry, techniques, components and other measures which can be incorporated in, applied to, or used in conjunction with communications-electronics equipments and systems. The program in this area is divided into three major, mutually complementary areas: theoretical analysis, design criteria, and instrumentation and measurement techniques (Figure 1). Each area is expected to provide requirements to its counterpart which, in turn, is expected to provide guidance in its area of interest. The outputs are intended to result in improved equipments and systems and are constantly fed into the research and development cycle by means of information bulletins, lectures, instruction manuals and training courses. In addition, every effort is made to furnish USAECOM contractors with all possible assistance in this area.

John J. O'Neil, Dep. Chief, Electromagnetic Environment Div., U. S. Army Electronics Command, Fort Monmouth, N. J., is responsible for the control of intentional and unintentional interference in the field army.

The theoretical analysis is a map study using the field army of the time period under study as an input. The organization is developed and tactically deployed down to the smallest organizational element in a geographical area typical of where future conflicts could take place. The needs of the field army organizations for communications, combat surveillance, air navigation, traffic control, etc., are prepared to reflect all these equipments on the geographical deployment. Having determined the location of equipments, a computer is then programmed with the x and y coordinates of the equipments, propagation and frequency assignment data, and pertinent characteristics of the transmitters and receivers.

This is a very simplified explanation of a highly complex procedure. However, the outputs from such a program yield valuable data not only in the electromagnetic compatibility area, but in the equipment and system design areas as well. This data is reflected in more realistic specification requirements, improved circuitry and more practical measurement techniques. In addition, the adequacy of proposed equipment and system design and the technical feasibility of concepts from the standpoint of their electromagnetic compatibility are also obtained.

Figure 2, which is an artist's concept of a typical Division Area Communication Center, is based on an output of this analysis. It is readily apparent that, because of the necessity for numerous equipments operating in such close proximity, great care will be necessary in their design to assure electromagnetic compatibility.

Thus the analysis program is a most important tool in guiding the research and development of electronic equipments and in assuring electromagnetic compatibility and interference reduction programs that are based on a

foundation of all available engineering information.

Specifications.

The requirements contained in electromagnetic compatibility and interference reduction specifications have long been subject to controversy with many contractors believing that the requirements are unnecessarily stringent. The electromagnetic compatibility engineer, having little data on which to base his requirements during the early 1950's, was prone to cite requirements which would most certainly assure interference-free operation of equipments in the field. The cost of meeting these requirements, however, was on occasion a good percentage of the overall cost of the end item.

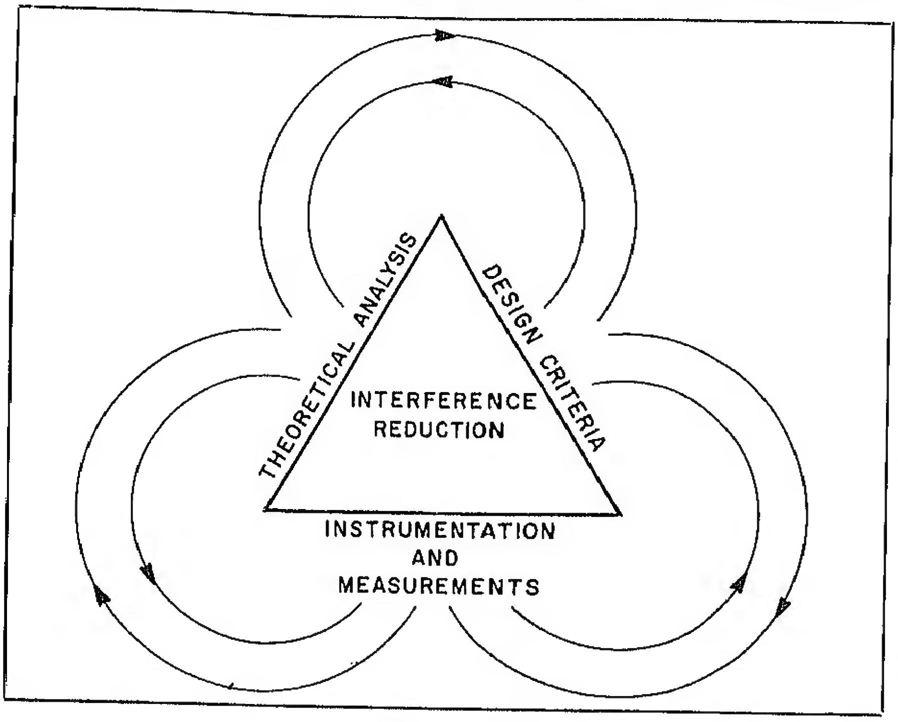


Figure 1.

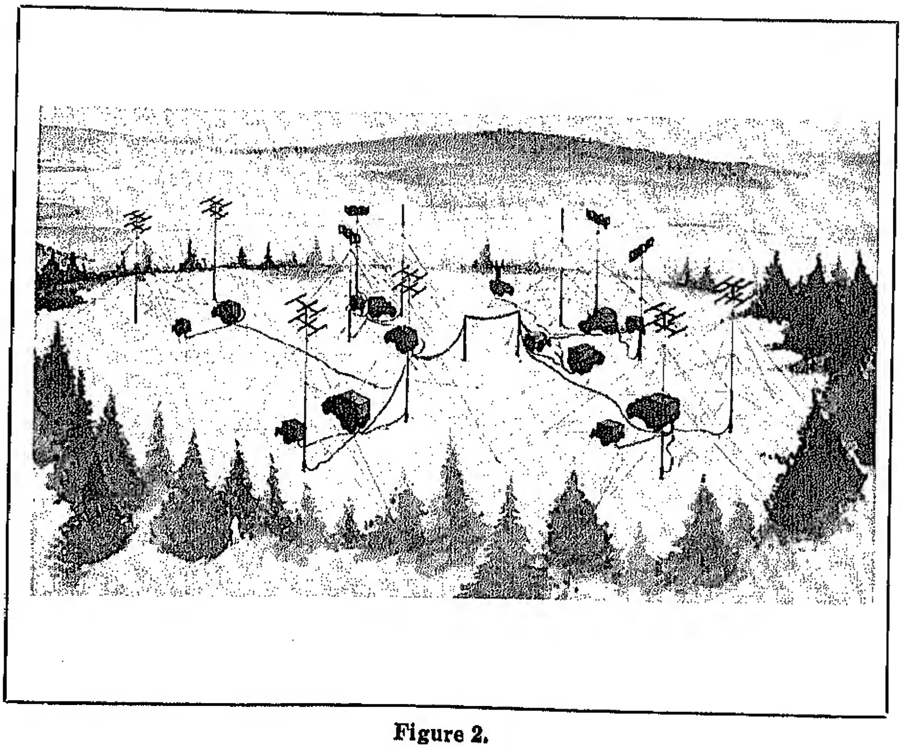


Figure 2.

USAECOM, utilizing data from its analysis program, can reflect requirements in its specifications which are realistic and, although some criticism is still heard, differences can generally be quickly resolved when the contractor is fully aware of the problem anticipated when the equipment he is developing reaches the theater of operation.

The measurement procedures specified in the specifications are not ideal and certainly subject to improvement. USAECOM has long believed that the most meaningful tests can be conducted only in an open area out-of-doors. The performance of tests in a shielded enclosure is, of course, the most ideal method. This is especially true in these days of expanding suburbs where open real estate is becoming scarcer each day. Consequently a research study is being conducted to eliminate the present source of errors in the testing of equipments in shielded enclosures. This technique will utilize newly developed antennae and a new configuration of enclosure. Although proceeding very satisfactorily, it is not anticipated that this program will be completed over the entire frequency range of interest for about 18 months. This program, coupled with the development program for automated instrumentation covering the frequency range of 14 HKz to 40 GHz which will reduce testing time by 75 percent, should greatly alleviate many of the problems now encountered in the testing of equipments.

For many years the three Services have insisted with some justification that, because of their individual peculiar requirements, a single tri-Service coordinated specification for all equipments was impractical. However, over the years with improved instrumentation and measurement procedures, coupled with analysis programs and field experience, it has become possible to standardize the requirements of the three Services and incorporate them into a tri-Service document.

The document will be in the form of three Military Standards, which will detail "Requirements" (MIL STD 461), "Measurement Procedures" (MIL STD 462) and "Standardized Definitions" (MIL STD 463). The standards will incorporate requirements and procedures for testing of communications-electronics equipment, non-communications-electronics equipment, electrical equipment, and special classes which will include vehicles, power lines, etc. Drafts of these documents are now being reviewed and commented upon by industry. Although they undoubtedly will require revision for a short while after being implemented, it is believed that more uniform testing and a considerable saving of time and money will result from this program. It is anticipated

that the standards will be completed during 1967.

USAECOM currently references Military Specification MIL-E-55301, titled "Electromagnetic Compatibility," as the governing interference reduction document in its procurement of electronic equipment. This specification is also used by other commands of the Army when procuring other types of interference producing materiel. It describes requirements for tactical, tactical support and administrative type equipment and combines and supersedes the requirements of four older specifications. This document has only been in use since April 1965 and has been generally well received.

In this document an effort was made to resolve a problem that has always faced the interference reduction engineer, i.e., being confronted with a piece of equipment ready for production, which does not conform to the specification, necessitating costly, bulky retrofits. Anything less than complete conformance may render the equipment, or adjacent equipment, useless when it reaches the field. It is necessary that he take an "educated guess" and attempt to recommend "hang-on" treatment which is never as effective or economical as when this problem is considered in the earliest design stage.

Consequently, MIL-E-55301 requires that the contractor submit a design plan which will specify the design aspects of the equipment insofar as electromagnetic compatibility is concerned. The preparation of this plan is time consuming. However, it is time well spent as the USAECOM specialist can generally recommend, when required, new circuitry and techniques which are frequently easier to apply, more economical, and provide greater effectiveness than that proposed by a contractor who has had little experience in this area, or who is not acquainted with the current state of the art. Similarly, a test plan is required prior to the performance of tests. This plan has proven invaluable as in many instances a contractor has overlooked requirements or proposed conducting unnecessary tests. These deficiencies, which previously would be noticed only when the test report was submitted and would on some occasions require costly re-testing, are now pin-pointed when the test plan is submitted for review. Similar requirements are incorporated in the new military standards.

Industry Management Role.

The tremendous increase in the use of electronic devices within DOD, which requires the use of the frequency spectrum for radiation or reception of electromagnetic energy, is not expected to lessen in the foreseeable future. The useable frequency spectrum is a vital resource and is insufficient to satisfy the needs of all the users unless the best possible efficiency is attained in its use. The necessity for interference reduction and electromagnetic compatibility can only increase during the coming years; like death and taxes we cannot avoid it.

It appears, therefore, that management in those companies designing and producing electronic equipments for the military should take an active role in establishing a program within the company which recognizes this problem in relation to the product (design, development, production). This program should receive full support of management and be integrated with allied efforts and progressively refined and improved to maintain state-of-the-art competence. It should assure that thorough consideration is given to electromagnetic compatibility through all aspects of design, development, production and test, as necessary.

Many contractors, recognizing the problem as one of overlapping interests, have established such programs and directed that all drawings be approved by their electromagnetic compatibility group prior to their use in the fabrication of equipment. Thus they avoid many costly mistakes in cabinet design, cable runs, assembly lay-outs, etc., and the necessity for corrective actions and retrofits. Experience has shown that the degree of compatibility achieved in an equipment is directly related to the emphasis placed on this program by management. It is believed that such a program would not only be self liquidating in a short time, but would relieve management of many problems and delays generally encountered when least expected.

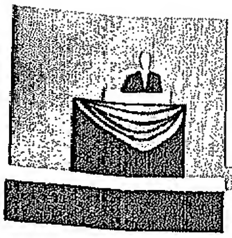
USAECOM Assistance.

As stated previously, USAECOM's electromagnetic compatibility program is intended to assure interference free operation of Army equipments in the field. Consequently, it is necessary that very close liaison be maintained with all development engineers and that all of USAECOM findings in the areas of improved circuitry, techniques, etc., be given widespread distribution. In addition, every effort is made to give USAECOM contractors all possible assistance in this area. A two-volume "Design Guide" has been published which provides the engineer with the necessary background and techniques to enable him to minimize the interference susceptibility and generation of the equipment he designs. This publication has received wide distribution and is available at the Defense Documentation Center, Cameron Station, Alexandria, Va., 22314; or it can be purchased from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, Springfield, Va., 22151. A continual updating program for this guide is planned. In addition, a "Shielding Effectiveness Design Reference" is now in preparation and should prove to be a valuable tool in assisting engineers to design the most effective rf shield for their purpose. This, too, will be given wide circulation.

USAECOM specialists are ready at all times to assist contractors in solving problems of conforming to the contractual electromagnetic compatibility requirement. The review of design plans, recommended state-of-the art circuitry and techniques, and sources of supply are among the services that are provided. Experience has shown that contractors, who avail themselves of the services, have little difficulty in meeting the electromagnetic compatibility requirement.

In summary, the use of the frequency spectrum can be illustrated in an excellent analogy cited by the Joint Technical Advisory Committee of the Institute of Electrical and Electronics Engineers. In its report titled, "Radio Spectrum Utilization," the committee stated: "The spectrum can be likened to a newly inherited set of fields of tillable rolling land. At first, the heir will farm the rich lowlands where he can work with tools he already has, to grow crops with which he is familiar. Soon, as his family's needs grow, he starts tilling some of the marginal land. In some areas, he finds new techniques are needed and that soil conditions are more favorable to new types of crops. To assist him in his work, he assigns lots to his offspring, ultimately to be theirs for their families. And then the day arrives when all the land is allocated and in partial use. There are no more green fields beyond to meet ever-growing demands. . . . The farmer must now concern himself with the science of agriculture, the economics of farm yield, and the realities of the existing assignment of land."

Although interference encountered in our daily lives may cause inconvenience and aggravation, its consequences in the military are of staggering magnitude. USAECOM and the Department of the Army, as well as the other Services, are devoting considerable time and money to advance the state of the art in the area of electromagnetic compatibility and to assure that the radio frequency spectrum, one of our most vital resources, is properly used. An ever increasing use of electronic equipments by the military is necessary to fulfill its mission. Unless measures are taken during the design and development of equipments to assure their electromagnetic compatibility when deployed in the field, severe self-jamming can result. Defense contractors, who design, develop and produce military electrical and electronic equipment, should maintain close liaison with the interference reduction specialists of their procuring Service and assure that all possible actions are taken to minimize the possibility of their equipment having little value when placed in service or, in fact, operating as an effective enemy jammer.



FROM THE SPEAKERS ROSTRUM

Address by Gen. John P. McConnell, USAF, Chief of Staff, U.S. Air Force, at American Ordnance Assn. Annual Defense Preparedness Meeting, Los Angeles, Calif., Oct. 5, 1966.

Gen. John P. McConnell, USAF

Planning for a Future Force Structure

In all our planning for the future, there is one factor which we cannot plan, and that is the future itself. We must, therefore, make certain assumptions which are based on the experiences of the past and the trends of the present. On that basis we must try to protect our needs for the immediate future and chart our course for the more distant future.

The aerial weapon systems which we have in our operational inventory today were largely conceived and designed years ago when no one could have possibly foreseen that airpower was destined to play a dominant role in a guerrilla war in Southeast Asia. The fact that we do have the quantities and types of aerial weapon systems to assume this unprecedented role is a great credit to the vision and perseverance of the men who planned and fought for these weapon systems.

By the same token, it is our responsibility to make as certain as is humanly possible that the weapon systems which we plan and recommend will be equally useful and adaptable to whatever needs the future may bring.

We have witnessed so many dramatic and unpredictable events in our lifetime that it may seem futile to try to anticipate conditions and requirements some five or ten years from now. This is just about the length of time it takes to bring a modern aerospace weapon system from conception and initial development to operational readiness. While the future holds many unknowns and variables, there are also some factors that give us a broad indication of what to expect and plan for.

In contemplating the future, there are four general areas of unpredictable developments, that is, developments over which we have little or no control. These areas are: political developments, military developments, technological developments, and catastrophic events.

Political developments may continue to bring about radical changes in the international power balance and the alignment of nations. Today's bitter enemy may be tomorrow's close ally and vice versa. I cite the example of Japan which was our ally in World War I, our enemy in World War II, and is now one of our staunchest allies. No one can predict the course of the Sino-Soviet split; it may be breached or result in a stand-off or, conceivably, lead to open hostilities. Revolutions and insurgency or the rise of a Hitler-type dictator somewhere in the world could possibly spark a major conflagration.

Wherever we look there are potential trouble spots, and chances are that there will be more and still graver threats to world peace in the years to come. One reason for this is the rising tide of nationalism among some of the developing nations. Another reason is the host of problems that will be caused by the population explosion. Ever worsening lack of food and essential raw materials, if not of actual living space, may induce some nations to try to take by force what they need from their more fortunate neighbors.

All these potential developments on the international scene will have a direct bearing on our national interests and will compel us to take some action, either for our own protection or that of a friendly nation which seeks our help. Examples of the past are our actions in the Quemoy, Lebanon and Cuban missile crises. No one can predict what crises we may face in the future, where they will occur and when, and what action we may have to take.

Closely related is the next area of unknowns—military developments—which, though not of our making, will involve us in one way or another. I am referring, in particular, to unprovoked acts of armed aggression such as we have had to help counter in Korea and, presently, in Vietnam. We must endeavor to deter and prevent such aggressive actions but, for some time to come, we can expect the communists to continue encouraging and supporting these so-called "wars of national liberation." Where and when the communists will strike next, we do not know and, perhaps, they do not know themselves.

Nor are future military developments that may pose a threat to us limited to local aggression and conventional wars. Looking further ahead, we must be prepared to deal with the problems resulting from nuclear proliferation. The prospects of Red China's intents, once she achieves an operational nuclear capability, are rather ominous. There is also evidence that a number of other and smaller nations will endeavor to join the expanding nuclear club, either for their own protection or for aggressive purposes.

Looking still further into the future,

it is conceivable that some ambitious dictator or belligerent nation will try to exploit the space medium for aggressive purposes, regardless of any international agreements to the contrary. Even a small nation, building on the developments made by larger and more affluent countries, could thus achieve political and military advantages out of proportion to its size and resources.

This brings me to the third area of unknown and unpredictable factors, namely, technological developments which may have a revolutionary impact on the means and techniques of warfare. As far as our own efforts are concerned, we have a fairly good indication of the advances we can expect to make in the years ahead, although some dramatic discovery or new phenomenon can lead to surprising technological breakthroughs. Needless to say, we cannot count on such breakthroughs, let alone incorporate them, in our planning for the future. Yet, with our accelerating progress, the next decade or two may bring scientific developments that defy our imagination today.

Even more difficult to anticipate are the technological developments pursued by hostile and potentially hostile nations, because their efforts are normally cloaked in the greatest secrecy. A major breakthrough on their part could seriously threaten the military superiority which we still possess today. For instance, if the Soviets should succeed in developing a highly effective defense against our ballistic missiles, perhaps based on some dramatic new discovery, they would gain an advantage comparable to our atomic monopoly after World War II.

The final area of unknowns for the future are catastrophic events such as major earthquakes and other disasters of far-reaching consequences. You may remember that the devastating earthquakes which Japan suffered in 1923, at a cost of over 120,000 lives, completely upset the timetable of the war lords who were then in power in that country. The most disastrous earthquake in recorded history occurred some 400 years ago in China when reportedly 830,000 people were killed. Disasters of such proportions can change the course of history and, in fact, can make helpful friends out of enemies or out of an aggressor and his intended victims.

From what I have said so far, it may appear that the future is fraught with so many unpredictable threats and variables that it is all but impossible to plan for it realistically and effectively. But sane analysis also permits certain conclusions which, if properly applied, can be used as broad guidelines for our planning, especially with respect to the military aircraft we may need in the future.

For one, we can be certain that, for many years to come, the world environment will be marked by instability, unrest and a wide range of conflicts. We also know that there will be continuing threats to our national interests and, indeed, our security. Since we are the most powerful and prosperous country on earth, the nations of the Free World will continue to look to us for leadership and assistance. By the same token, the forces of aggression will, as heretofore, consider us the main obstacle to the attainment of their objectives and will, therefore, endeavor to sap our strength by drawing us into conflicts of every conceivable type.

Hence, our commitments, as well as our involvements, will remain global in scope as they have been since World War II but, because of the growing capabilities of our opponents, they will doubtless place increasing economic and military demands on us. Finally, we must anticipate that we may become involved in conflicts at any level of intensity, ranging from local crises and insurgency to limited wars and, possibly, nuclear aggression.

All these conclusions establish the general environment for which we have to plan. Since we cannot predict the specifics, our plans must be flexible enough to be adaptable to unforeseen conditions and developments. At the same time, however, our plans must be definite enough to allow us to prepare ourselves adequately for any future contingency and threat.

Such planning is far more difficult and complex for the military than for any other area of national endeavor. We know that, regardless of what the future may hold, we as a nation must remain strong economically, scientifically and morally. But our strength in these areas is not measured in relation to someone else's "counter-strength" nor is it subject to unpredictable influences.

The opposite is true for the military strength which we require today and will require in the world of tomorrow. It makes little difference how strong we consider ourselves militarily; what counts is what our enemies and potential aggressors think of our military capabilities in relation to theirs and with respect to their intentions.

Our first problem, therefore, is to try to identify the most likely and serious threats and plan accordingly. This is as much a matter of assumptions as of interpretation, and the next problem is to get agreements on the assumptions and approval of the interpretation. Just try to imagine the reaction if, a few years ago, the Air Force would have asked for many millions of dollars worth of conventional bombs so that, in case we should become involved in a guerrilla war somewhere in Asia, we would not be caught with our munitions down!

Fortunately, there is one constant factor in this perplexing equation of variables and unknowns, and that factor is our national policy. It has been, still is, and will continue to be our national policy to help establish and maintain a world environment in which sovereign nations can prosper and pursue their chosen way of life without fear of aggression. The pursuit of this policy is not only in our own national interest but is also a moral obligation befitting this, the greatest nation on earth.

The role of the military in the attainment of these national objectives is to serve our Government as an instrument for the management of conflicts which threaten the security and welfare of this country or of any other free nation. While our national objectives do not change, the conditions under which we pursue these objectives keep changing constantly and profoundly. This means that our military strategy and, hence, our military capabilities must change commensurately.

For a number of years following World War II our military strategy was based primarily on the problems of nuclear war and its deterrence. As the Soviets kept building up their nuclear capability, our military strat-

egy underwent various modifications which were intended to provide the best deterrent to nuclear aggression under prevailing conditions.

The prevention of nuclear war has remained our principal task to this day and will remain so throughout the indefinite future. The preservation of our nuclear superiority on one hand and, on the other, our demonstrated determination to prevent nuclear war have induced the communists to resort to conflicts at the lower levels of intensity. This, in turn, compelled us to place increasing emphasis on our conventional forces in addition to maintaining a credible margin of nuclear superiority. Thus our strategy grew into one of "flexible response," designed to give us a range of options in responding to acts of aggression under the protective "umbrella" of our nuclear deterrent.

The question arises what kind of military strategy we will need to meet the broad requirements and uncertain threats of the future. Recent events have shown that conflicts with which we must cope may range from local crises, such as occurred in the Dominican Republic, to large-scale limited war, such as we are now fighting in Southeast Asia. With Red China approaching an operational nuclear capability and with the chance of nuclear proliferation, the possibility of nuclear aggression cannot be ruled out either.

This means that, in order to cope with the increasingly demanding conflicts of the future, we must be fully prepared to act or react and to deter or, if necessary, fight at any level across the entire spectrum of conflict intensity. This is indeed a big order, and we can fill it effectively and economically only through a well planned management approach which is designed for the whole conflict spectrum, rather than rely on unplanned "ad hoc" strategies. For this reason we are gradually turning to what may be called the "military strategy of conflict management." This wide-ranging strategic concept serves the following objectives:

- Still foremost, deter nuclear war by maintaining a sufficient margin of strategic superiority to assure the destruction of any aggressor and to keep the potential damage to ourselves within acceptable limits.

- Endeavor to deter conflicts at all lower levels of intensity and, if deterrence should fail, keep such conflicts at the lowest possible level and help resolve them to our advantage.

- Assist in the resolution of local crises and help prevent them from expanding into armed conflict.

To achieve these objectives, the strategy of conflict management requires a force structure which meets the following conditions:

- It must be capable of instant and effective reaction to any demands made on it by our national leaders.

- It must possess such flexibility that it can be adapted to any conditions, scope and level of conflict, offering a wide range of options and be responsive to any changes in organization and tactics.

- Weapon systems and equipment must be superior to those of any enemy and be adaptable to unprecedented requirements or conditions.

- Since we cannot afford to maintain forces and bases at or near every potential trouble spot around the world, there will be an expanding requirement for mobility. This calls for further emphasis on airlift which must serve to deploy increasing numbers of troops with their equipment to any place on earth, and to do so expeditiously and safely.

- The global deployment of our forces and the need for rapid, well coordinated action demand highly advanced command-and-control systems which are foolproof, reliable and survivable under the most adverse conditions.

Time does not permit me to go into further details but there is one more requirement I want to mention, and that is the need for achieving all this at an acceptable cost. Economics may be secondary where the very survival of our nation is concerned, but we cannot afford to strain our economy to the point where physical survival would become meaningless. I am confident that, through wise management and good judgment, we can obtain and maintain a force structure that meets the military demands of the future and yet imposes no undue strain on our economy and resources.

Address by Hon. Robert A. Brooks, Asst. Secretary of the Army (Installations & Logistics), at Annual Meeting of the Association of the U.S. Army, Washington, D.C., Oct 12.

Hon. Robert A. Brooks

Defense Materials System

(Editor's Note: Although this address is repetitious to some degree of the articles on the Defense Materials System published in the November issue of the Bulletin, *it is carried here to emphasize the importance placed on the operation of the system by key Defense officials.)*

World conditions today demand many unprecedented efforts to insure our national security. Increases in the size and composition of our defense program are certainly evident of such endeavors. There are many measures which can be taken by the Government to protect our national security. The deployment of military forces to various parts of the world, the development of new weapon systems, and foreign aid are a few examples which are familiar to most Americans. Other measures are not so obvious to the general public. One of these is the operation of the Defense Materials System in our economy and this is the primary topic of my discussion.

While I don't propose to go into the details of the operation of this system, I think it is both timely and very important that industry be made fully cognizant of its existence, its purpose and its requirements. *(See "The Defense Materials System and Priorities," page 1, and "The Use of DMS and Priorities by the DOD and*

Defense-Related Agencies," page 8, Defense Industry Bulletin, November 1966.)

The Defense Department finds itself in a unique situation probably never experienced in the same degree in the history of this country, or any other country for that matter. I am referring to current efforts toward maintaining the defense posture in support of a significant effort in Vietnam, while at the same time avoiding imposing any real controls or restrictions on the civilian economy. Naturally, our first concern is focused upon meeting military requirements in a timely manner. However, there is a concurrent and concerted effort within DOD to avoid actions which might create an adverse impact on the civilian economy. Obviously, this is a most difficult task, one requiring a sound and healthy economy which is prepared and willing to support the efforts necessary to assure our national security.

Several trends have been uncovered which indicate that industry and Defense are beginning to feel the pinch of trying to satisfy increased defense requirements in an economy which is straining to meet increased consumer demands. In this connection, the Army has detected a reluctance on the part of industry to respond to invitations to bid and requests for proposals. By way of an example, a review of five separate solicitations showed that out of 233 companies solicited, just four responses were received. This is not an isolated instance; there are other examples of similar magnitude listing such reasons for non-response as: engaged in other work, insufficient capacity, unable to meet delivery schedule, prefer commercial work, and just not interested.

Another factor, which is perhaps cause for greater concern, focuses upon increased lead times for many items which we procure. For example, needed forgings, castings and extrusions appear to be the pacing factor in many instances. This particular problem was considered of sufficient magnitude to warrant studies by the Air Force and the Army and, late in September, the Assistant Secretary of Defense (Installations and Logistics) asked the Air Force to head up a DOD team to study the situation and make recommendations. It is contemplated that industry cooperation will be enlisted to assure proper consideration of this problem.

While such trends tend to indicate that sellers' markets prevail, that a tight labor market exists, and that there is strong competition for certain materials, components and machine tools, the Army is not yet convinced that industry has reached the saturation point. However, these trends are sufficient to warrant increased study and remedial action within the limits of current policy and procedures. Some of the steps which have been taken to adjust our procurement programs to the stresses of the present economic environment are:

- Increased use of range bidding where production capacity is limited.
- Increased use of multi-year procurements to take advantage of standardization and stabilized prices over a longer period of time.
- Advance release of procurement information to enable industry to better plan its production.
- Maximum utilization of Government-owned production capacity. Eight reserve Army plants were reactivated during FY 1966. In addition, tools have been diverted from other standby packages to meet active production requirements, where appropriate.
- Release of materials from the national stockpiles.
- Use of substitute items and materials, where feasible.
- A greater emphasis on use of the Defense Materials System.

I would like to specifically call your attention to the latter, the Defense Materials System, usually referred to as DMS. To provide the President with the necessary authority to promote the national defense, the Congress has continued in effect the Defense Production Act of 1950, as amended. The act authorizes the President to:

- Require that performance under contracts or orders, which he deems necessary or appropriate to promote the national defense, shall take priority over performance under any other contract or order, and to require acceptance and performance of such contracts or orders in preference to other contracts or orders by any person he finds to be capable of their performance.
- Allocate materials and facilities in such manner, upon such conditions, and to such extent as he shall deem necessary or appropriate to promote the national defense.

The President, by executive order, has delegated these authorities to the Office of Emergency Planning. This office has, in turn, delegated to the Secretary of Commerce the responsibility to administer the priorities and allocations functions with respect to industrial production, construction and most materials. DMS is the means employed to carry out these authorities and it is designed to accomplish two main purposes. First, it is a means of directing the flow of materials and products to insure that defense programs are maintained on schedule. Second, the operation of the system permits the maintenance of an administrative means for promptly mobilizing the industrial resources of the country in a limited or general war. This is not a standby system of priorities. It has been in continuous operation since 1953. However, until recently there was only a limited need for recourse to priorities assistance since the national industrial economy was generally able to supply defense needs at the requested rate. Increased defense requirements to support the buildup in Vietnam placed a sudden demand on the need for special priorities assistance. Within the Army Materiel Command (AMC) alone, the number of requests for special priorities assistance rose from 57 in January 1966, to 98 in February, and 196 in March. This rapid increase leveled off in April and AMC is currently processing approximately 160 requests per month. Between January and August, AMC processed a total of 1,182 such requests. This is considered a substantial increase when compared with a total of 391 processed during calendar year 1965. A significant number of these requests were for production equipment for defense contractors, a good indication that industry has been required to expand capacity to assist DOD in meeting its increased requirements. The majority of these cases involve a hard core of critical items, materials and components. Examples are extrusions, forgings, castings, electronic components, machine tools, canvas, nylon webbing, electric cable and magnet wire. Suppliers are reporting that their order boards are filled to capacity with

rated orders and it appears that competition between rated orders exists at the lower subcontract levels as well as at the prime contract level.

In an effort to cope with this condition, the Defense Department and the Business and Defense Services Administration (BDSA) jointly conducted 30 orientation meetings across the country for both industry and Government personnel during April, May and June of this year. In addition to conducting orientation meetings, DOD reinstated the scheduling procedures designed to spread production of short supply items among the various military customers in an effort to assure that deliveries are made according to individual program urgencies. Notwithstanding these efforts, there is much that needs to be accomplished within DOD, associated agencies and BDSA. Two specific areas which were highlighted for further effort were a need for additional education on the use of the Defense Materials System, and a need to provide adequate personnel support for proper manning of the offices responsible for priorities and allocations functions. Both areas are receiving continuous attention.

I want to emphasize that under the authorities of the Defense Production Act, contractors can be required to accept and perform under contracts and orders which the President deems necessary to promote the national defense, and that such contracts and orders take precedence over other contracts and orders. I also want to emphasize that use of the priorities rating is mandatory for industry as well as DOD. Nearly all defense orders bear a priority rating. There is an optional provision for contracts and orders under $500, but the current practice is to rate even these small orders. The mandatory use of ratings protects the priority status of the procurement cycle throughout the entire chain of supply from the originating Defense agency down to the lowest tier subcontractor and supplier.

There are just two ways in which a priority rating can be obtained. One is through a Government agency authorized to assign priority ratings. The other is through your customer producing under a rated order. There are just two ratings which can be assigned. One is called a DX rating and the other a DO rating. DX is the higher rating and is assigned only as an emergency rating in cases of extreme urgency. All DX ratings have equal preference, but take precedence over all DO or unrated orders. All DO ratings have equal preference, but take precedence over all unrated orders.

The DX rating is assigned to certain programs selected by the President as having the highest national priority. Except for these designated programs, DX ratings are assigned as a bottleneck-breaking device, and are issued only by BDSA. Further, all DOD-rateable contracts include a uniform priorities and allocations clause which requires the contractor to comply with BDSA regulations in obtaining materials and products needed to fill his contract or order. Copies of pertinent BDSA regulations may be obtained from Department of Commerce regional offices.

Programs having the highest national priority are very few in number, of a relative small dollar volume, and are deemed of such importance that every possible authority is used to prevent them from being delayed. At present, DX-rated programs are 14 in number and are known as "Brick-Bat .01" programs. Twelve are administered by DOD and two are administered by the National Aeronautics and Space Administration. The total dollar volume of all 14 programs is less than 25 percent of the total rateable procurement. A limitation of 25 percent is placed on such programs to keep the DX rating meaningful.

In some cases, the regular procedures provided by the Defense Materials System may not be sufficient to enable contractors to fulfill defense deliveries on schedule. This may result from a variety of situations such as conflicting rated orders on the supplier's schedule, inadequate facilities to produce the required product, and the like. To aid defense contractors in overcoming such production bottlenecks, or to expedite deliveries, BDSA provides special assistance. Under such conditions the contractor may submit a request for special assistance to the local office responsible for administering the contract. This request is submitted in accordance with instructions from the responsible procuring agency and each agency in the chain of command attempts to correct the problem. If intermediate agencies are unable to overcome the difficulty, the request is forwarded to BDSA for appropriate action. BDSA provides special assistance in such cases by several methods such as:

- Arrangement of improved delivery dates by informal agreement with supplier.
- Issuance of a DX rating if appropriate.
- Issuance of a directive requiring the supplier to produce the specified item by a specific date.

The chances of successful action are greatly enhanced by the early receipt of such requests and the completeness and accuracy of the information furnished by the defense contractor. The special assistance procedure, however, should not be considered a substitute for early placement of rated orders on suppliers and adequate follow-up to determine that original shipping promises remain valid.

There are other means of assisting DOD in its efforts to meet increased requirements without creating an adverse impact on the civilian economy. Industry, for example, should seek every means to avoid use of critical materials through increased emphasis on value engineering. Substitution of materials may not only enhance the contractor's ability to meet delivery schedules, but may well result in increased profits. Industry should also exert every effort to seek additional sources of supply through more effective "make or buy" programs, rather than waiting for their own production capacity to open up.

A strong and ready industry is as much a part of our national defense as a competent military organization. The Army-industry relationship must be maintained as a dynamic one, whether it be the ability to produce the standard hardware, gear up to fabricate new and more sophisticated designs, or accelerate to produce the emergency requirements in support of the Southeast Asian contingency. Many firms which originally produced nothing but military products have expanded into the commercial market and have become relatively self-sufficient and no longer need to rely on defense contracts. Conversely, industrial ingenuity has also fostered the development of commercial application for many defense-oriented techniques and items. Only through continued cooperative efforts between Defense and industry can the strength of our nation be maintained to meet any threat to our security.

The Impact of Vietnam

(Continued from Page 5)

the initial production run. There is no doubt that everyone in industry can understand our concern here, and any suggestions that will assist in meeting the problem are welcomed.

In summary, it can be said that, while there has been increased interest in and emphasis on providing RDT&E support for Vietnam operations, this has been mainly for the shorter-term solutions. In addition, there has been some increased use of off-the-shelf items, particularly those which are readily modified to meet a requirement. We intend to continue this practise where it is advantageous.

We have expedited the development of electronic items wherever possible for earlier introduction into Vietnam, but the full results of these efforts are not yet available since the fielding of these units began only this year. In keeping with this practice, it is probable that some of electronics items now in the Army RDT&E program will have first use in Vietnam.

The Army's current interest in electronics is two-fold: We retain an active interest in systems and devices for use in Vietnam—on both a long-term and short-term basis; we do not intend to slight or reduce Army's RDT&E efforts in support of its world-wide missions.

Deep Submergence

(Continued from Page 7)

ing external lift. Investigation, object preparation and rigging will be accomplished using divers or manned submersibles developed under the man-in-the-sea rescue and search programs. When achieved, the system objective—deep ocean salvage—will extend man's work capabilities far below the 280 feet now attainable by standard diving methods.

Funds are to be expended for a life support system to be used as a part of salvage program as well as supporting the man-in-the-sea experiment in 1967. The life support system consists principally of a personnel transfer chamber and a rest and refuge tent habitation used at depths up to 600 feet and a surface-mounted deck decompression chamber.

Research on gas generation under ambient pressures, displacement and de-watering materials, and pontoon systems controllability is planned. Problems associated with adapting deep submergence vehicles for salvage use will also be investigated.

Nuclear Powered Deep Submergence Research and Ocean Engineering Vehicle (NR–1).

On April 18, 1965, President Johnson announced that the Atomic Energy Commission and the Department of the Navy had undertaken the development of a nuclear-powered deep submergence research and ocean engineering vehicle. The capability of this manned vehicle, designated the NR–1, will be an order of magnitude greater than any other developed or planned to date because of the vastly increased endurance made possible by nuclear power, and the technology gained by its development will provide the basis for development of future nuclear-powered oceanographic research vehicles of still greater versatility and depth capability.

The NR–1 vehicle, which will be able to move at maximum speed for periods of time limited only by the amount of food and supplies it carries, will have a crew of five and two scientists. The vehicle will be able to perform detailed studies and mapping of the ocean bottom, temperature, currents and other oceanographic parameters for military, commercial and scientific uses. The development of a nuclear propulsion plant for an oceanographic research vehicle will result in great independence from surface support ships and essentially unlimited endurance of propulsion and auxiliary power for detailed exploration of the ocean.

The submarine will have viewing ports for visual observation of its surroundings and of the ocean bottom. In addition, a remote grapple will be installed to permit collection of marine samples and other items. With its depth capability the NR–1 is expected to be capable of exploring areas of the continental shelf, an area which appears to contain the most accessible wealth in mineral and food resources in the seas. Such exploratory charting may also help the United States in establishing sovereignty over parts of the continental shelf. A ship with its depth capability will be capable of exploring an area several times that of the United States.

The Navy's DSSP office has overall responsibility for the NR–1's development. The Naval Ship Systems Command is responsible for vehicle design, development and construction. The Atomic Energy Commission's Division of Naval Reactors is responsible for the design, development, construction and test of the nuclear propulsion plant. Design and development of the reactor has been assigned to the Atomic Energy's Commission's Knolls Atomic Power Laboratory, Schenectady, N.Y. Design and construction of the vehicle will be performed at General Dynamics Corporation's Electric Boat Division, Groton, Conn.

Overseas Civil Service Positions Open

The Army Electronics Command (ECOM) at Fort Monmouth, N.J., is seeking applicants for electronic equipment specialists and training instructors to serve overseas in civil service grades GS-7 through GS-11. Salary for the open positions range from $6,451 through $9,221 a year.

Equipment specialists, grades GS-9 through GS-11, will be assigned initially to Vietnam, to work in ECOM's Technical Assistance Program.

Training instructors, grades GS-7 and GS-9, will be given frequent and short-time assignments in all parts of the world. Selectees will undergo factory or service school training, and will work in teams giving new materiel briefings and new equipment training. A basic knowledge of electronics and communications is necessary for these positions.

Specialization for the equipment specialists is in the areas of communications, surveillance, avionics, air defense and infrared. Working in the Technical Assistance Program, they provide assistance, including instruction, installation, operation, maintenance and related supply of electronic equipment for field commanders in the Army's world-wide operations.

Contact for information on the equipment specialists program is Frank P. Gavin, Civilian Personnel Div., Russell Hall, Fort Monmouth, N.J. 07703. (Area Code 201) 532-1048.

Contact for information on the training instructors program is Mrs. Josephine Jubert, Civilian Personnel Div., Russell Hall, Fort Monmouth, N.J. 07703 (Area Code 201) 532-1548.

DEPARTMENT OF DEFENSE

Lt. Gen. Theodore J. Conway, USA, has been assigned as Commander-in-Chief, U.S. Strike Command, and U.S. Commander-in-Chief, Middle East/Southern Asia and Africa, and has been named for a recess appointment to the grade of general. He succeeds Gen. Paul D. Adams, USA, who retired Nov. 1.

VAdm. Vernon L. Lowrance, USN, has been named Dep. Dir., Defense Intelligence Agency.

Dr. Edmund E. Dudek, formerly Technical Dir., Naval Personnel Research Activity, San Diego, Calif., has been appointed to a newly created position as Military Manpower Research Coordinator in the Office of the Asst. Secretary of Defense (Manpower).

Dr. Harold O. Wycoff has assumed duties as Dep. Scientific Dir., Armed Forces Radiobiology Research Institute.

Seymour J. Deitchman has been appointed Dir., Remote Area Conflict, Advanced Research Projects Agency, succeeding Maj. Gen. C. J. Timmes, USA.

Maj. Gen. Milton B. Adams, USAF, has been appointed Dep. Dir. for Forces, Defense Communications Planning Group, Defense Communications Agency.

William R. Laidlaw, Vice President of Research & Engineering, Los Angeles Div., North American Aviation, Inc., has been selected as Spec. Asst. to the Dir., Defense Research and Engineering.

Leonard Sullivan Jr. has been appointed Dep. Dir. of Defense Research and Engineering (Southeast Asia Matters).

RAdm. Fowler W. Martin Jr., USN, has been designated commander of the Defense Fuel Supply Center, Alexandria, Va.

Col. John G. Wheelock, III, USA, has been designated as Dir., Policy Planning Staff, Office of Dep. Asst. Secretary of Defense (Planning & North Atlantic Affairs), Office of Asst. Secretary of Defense (International Security Affairs).

Capt. Raymond S. Sullivan, USN, has been named Dir., Defense Contract Administration Service Region, St. Louis, Mo.

The Military Traffic Management and Terminal Service (MTMTS), Washington, D.C., has announced the following assignments: **Capt. Francis S. Grubb, USN,** Dir. of Freight Traffic; **Col. Homer L. Sellers Jr., USA,** Dir. of Terminals and Installations; **Col. Glen F. Petrie, USA,** Office of Comptroller and Programs. MTMTS also announces the retirement of **Col. Charles B. Claypool, USA,** former Dir. of Terminals and Installations and **Col. Armour S. Armstrong, USA,** former Dir. of Freight Traffic.

Col. Clarence J. Douglas Jr., USAF, has been assigned as Asst. to the Dir. for Programs Control, Defense Communications Planning Group, Defense Communications Agency.

Col. Jacksel M. Broughton, USAF, and **Col. Victor N. Cabas, USAF,** have been assigned as Air Force members, Weapons Systems Evaluation Group, Office of the Secretary of Defense.

Col. Leo G. Fradenburg, USAF, has been named Dep. Dir., Education Programs and Management Training, Office of the Dep. Asst. Secretary of Defense (Manpower).

New assignments in the Office of Asst. Secretary of Defense (Public Affairs) are: **Col. Jessie E. Stay, USAF,** Dep. Dir. of Defense Information; **Col. George F. Hamel, USA,** Chief, Veterans & Civic National Organizations Div., Directorate for Community Relations; **Col. Thompson M. Colkitt, USA,** Chief, Army Div., Directorate for Security Review.

DEPARTMENT OF THE ARMY

Maj. Gen. Frederick J. Clarke has been assigned as Dep. Chief of Engineers, Office of the Chief of Engineers, Washington, D.C. **Maj. Gen. Robert F. Seedlock** replaces Gen. Clarke in the triple role of Commanding General, Army Engineer Center; Commandant, Army Engineer School; and as Commanding General, Fort Belvoir, Va.

Brig. Gen. A. P. Rollins Jr., has been named Dir. of Military Construction, Army Corps of Engineers, the position formerly held by Gen. Seedlock.

Brig. Gen. Joyce B. James has been assigned as the new Dep. Commanding General, Strategic Communications Command, succeeding Brig. Gen. Walter B. Bess, who retired.

Dr. William Van Royen heads the new Environmental Sciences Div. of the Army Research Office-Durham, N.C.

Col. George H. McBride, Project Manager of the Hawk air defense missile system has been nominated for promotion to the rank of brigadier general.

Col. Nils M. Bengtson, who has just returned from a year in Vietnam, has been assigned as Dir., Research & Development, Army Missile Command, Redstone Arsenal, Ala.

Col. Delbert L. Bristol has assumed duties as Dep. Commander, Army Aviation Materiel Command, St. Louis, Mo.

Col. Eugene B. Datres has been named Dep. Commander, Army Satellite Communications Agency, Fort Monmouth, N.J.

Col. George H. Russell has been appointed as Dep. Dir. of Developments, Office of the Chief of Research & Development, Department of the Army.

Col. William W. Stone Jr. has relieved Col. James H. Batte, as Commanding Officer, Edgewood Arsenal, Md.

Lt. Col. Donald H. Steenburn has been assigned duty as Chief of the Chaparral Management Office, Army Missile Command, Redstone Arsenal, Ala.

DEPARTMENT OF THE NAVY

RAdm. Lewis C. Coxe has been reassigned from duty as Commander South Western Area, Naval Facilities Engineering Command, to the position of Dep. Commander for Acquisition, Naval Facilities Engineering Command, Washington, D.C.

Capt. Paul J. Hartley Jr. has been assigned to the Anti-Submarine Warfare System Projects Office in Washington, D.C.

DEPARTMENT OF THE AIR FORCE

J. William Doolittle has been appointed as General Counsel of the Air Force succeeding Stephen N. Shulman who has become Chairman of the Equal Employment Opportunity Commission.

Brig. Gen. Ralph G. Taylor Jr., is now serving as Commander, USAF Tactical Fighter Weapons Center, Nellis AFB, Nev.

Donald R. Eastman Jr. has been appointed as Technical Advisor to the Commander of the Arnold Engineering Development Center, Tenn.

Col. Elmer Torgesen has been assigned as Dir., Category III Test Management, 407L Program, Tactical Air Warfare Center, Eglin AFB, Fla.

Col. Alfred D. Blue has been assigned as Chief, Electronics Div., Office of Dep. Chief of Staff (Research and Development), Directorate of Science and Technology, Air Force headquarters.

Col. James O. Frankosky has been assigned as Dep. Dir. for Strategic and Defense Forces, Office of Dep. Chief of Staff (Research and Development), Directorate of Operational Requirements and Development Plans, Air Force headquarters.

Col. John McCorkle, Dir. of Materiel Management since May 1965, has been named Dep. Commander, Mobile Air Materiel Area, Brookley AFB, Ala.

New assignments in the Air Force Systems Command are: **Col Robert A. Duffy,** Dep. Dir., Air Force Avionics Laboratory, Research and Technology Div., Wright-Patterson AFB, Ohio; **Col. David S. Mellish,** Dir., Air Force Weapons Effectiveness Testing, Air Proving Ground Center, Eglin AFB, Fla.; **Col. William P. Lemme,** Air Force Plant Representative, Boeing Co., Air Force Contract Management Div., Wichita, Kan.; **Col. Calvin W. Fite,** Dep. for Limited War, Aeronautical Systems Div., Wright-Patterson AFB, Ohio; **Marc P. Dunnam,** Dep. Dir., Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio.

OFFICE OF PROGRAM APPRAISAL

RADM THOMAS D DAVIES (Dir)	4D730	79396
Dr James R Larkin (Dep Dir) and	4D730	79396
(Dep For Systems Analysis)		79152
EXEC ASST FOR DIR AND DEP DIR		
CAPT John D Stufflebeem	4D730	79396
COL James P Rathbun USMC	4D725	75241
(Dep for USMC Matters)		

OFFICE OF INFORMATION

RADM [illegible] MILLER	[illegible]	[illegible]
(Chief of Information)		
CAPT [illegible]	[illegible]	[illegible]
(Deputy Chief of Information)		

[illegible]

ASSISTANT SECRETARY OF THE NAVY

(FINANCIAL MANAGEMENT)

HON CHARLES F BAIRD	[illegible]	[illegible]
(Comptroller)		
CAPT Eugene [illegible]	[illegible]	[illegible]
(The Executive Assistant and Naval Aide)		

OFFICE OF THE COMPTROLLER

RADM [illegible]		[illegible]	[illegible]
(Dep Compt)			
COL [illegible] USMC		[illegible]	[illegible]
(Asst for [illegible] Matters)			
Asst for Admin			
(Vacant)		[illegible]	[illegible]
(Asst for Policy Coordination)			
CAPT [illegible] USN		[illegible]	[illegible]
(Asst for Financial Management [illegible])			
COUNSEL			
Dr [illegible]		[illegible]	[illegible]
CONTRACT FINANCING			
Mr John [illegible]		[illegible]	[illegible]
MANAGEMENT EVALUATION			
Mr [illegible]		[illegible]	[illegible]
(Asst [illegible])			
DIRECTOR OF BUDGET & REPORTS			
RADM [illegible]		[illegible]	[illegible]
DIRECTOR OF FINANCIAL SERVICES			
RADM [illegible]	Arlo	[illegible]	[illegible]
AUDITOR GENERAL			
CAPT [illegible]	Arlo	[illegible]	[illegible]

[illegible]

HEADQUARTERS, U S MARINE CORPS

COMMANDANT OF THE MARINE CORPS [illegible]

GEN WALLACE M GREENE JR USMC	[illegible]	[illegible]
COL [illegible] USMC	[illegible]	[illegible]
(Military Secretary)		

ASSISTANT COMMANDANT

LTGEN [illegible] USMC	[illegible]	[illegible]
MAJ [illegible] USMC	[illegible]	[illegible]
(Administrative Assistant)		

[illegible]

December 1966

ZATIONAL POSITIONS IN THE NAVY DEPARTMENT

4E685 53131
4E656 54503
Naval Aide)

THE NAVY
4E728 53141
4E728 53140
Naval Aide)

OFFICE OF THE JUDGE ADVOCATE GENERAL

RADM WILFRED HEARN (JAG) 2E336 53121
RADM Robert H Hare (Dep JAG) 2E338 71107

ADMINISTRATIVE OFFICE
NAVY DEPARTMENT

MR JOHN H WALTER (Adm Off) 0014 62221

OFFICE OF NAVAL PETROLEUM AND OIL SHALE RESERVES
(Munitions Building)

CAPT HOWARD N MOORE
(Dir) 1848 63966

NAVAL PERSONNEL BOARDS

CORRECTION OF NAVAL RECORDS
Mr Charles E Curley Arlx 4115 41671
(Recorder)
DECORATIONS & MEDALS
CAPT John A Ferguson USN
(Senior Member) Arlx G-701 42363
NAVY COUNCIL OF PERS BOARDS
CAPT C W Travis Arlx G-074A 41663
(Director)
NAVAL EXAMINING (SUPPLY CORPS)
CAPT John A Scott (SC)
(President) Arlx 2060 41942
NAVAL PHYSICAL REVIEW COUNCIL
CAPT J T Bland Arlx 1024 44547
(Chairman)

ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS & LOGISTICS)

HON GRAEME C BANNERMAN MN 2046 61213
CAPT William J Robinson MN 2046 63213
(The Executive Assistant and Naval Aide)
Mr Wells Thomsen MN 2505 62176
(Dir of Logistics Review)
CAPT G C Bonnell MN 2505 62176
(Dir of Supply Support and Equipment Readiness)
CAPT J L Howard MN 2513 63325
(Dir of Procurement)
CAPT W F Engel MN 2516 63817
(Dir of Industrial Engineering)
CDR J H Hill MN 2506 61321
(Dir of Installations & Facilities)

DEPUTY UNDER SECRETARY OF THE NAVY (MANPOWER)

MR RICHARD A BEAUMONT 4E792 73913

OFFICE OF CIVILIAN MANPOWER MANAGEMENT
(Pent Annex II)

(Reorganization in Process - Temporary Organization)
MR RICHARD A BEAUMONT 222 52003
(Director, Civilian Manpower Management)

THE SPECIAL ASSISTANT TO SECRETARY OF THE NAVY

MR NORMAN J REAM 4E717 50359

OFFICE OF MANAGEMENT INFORMATION

CAPT JAMES M BROGAN (SC) 5E781 57051
(Director)
COL David W McFarland USMC 5E781 72267
(Deputy Director)
ASST DIR FOR INFO & DATA SYSTEMS
CAPT Frank S Haak 4E777 75213
SYSTEMS DEVELOPMENT DIVISION
Mr Earl H Kuhl (Dir) 5E773 57961
PROGRESS APPRAISAL DIVISION
Mr Houston W McCrary (Dir) 5E813 56101
SYSTEMS AUTOMATION DIVISION
Mr W Henry Hill (Dir) 5E769 77622

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TIONS
4E660 55007
4E672 55664

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4E648 78347
4E636 59955

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HEADQUARTERS, NAVAL MATERIAL COMMAND

CHIEF OF NAVAL MATERIAL
(Main Navy)

VADM I J GALATIN 2010 63500
CAPT W G Lessman 2010 65235
(Admin Aide)

VICE CHIEF OF NAVAL MATERIAL

RADM Ralph L Shifley 2010 63548

*

*Individual organization charts of the Office of the Chief of Naval Operations; Headquarters, Naval Material Command; and Headquarters, U.S. Marine Corps will appear in the January issue of the *Defense Industry Bulletin*.

Top 100 Defense Contractors for FY 1966 Announced

Top 100 Companies and Their Subsidiary Corporations Listed According to Net Value of Military Prime Contract Awards Fiscal Year 1966 (July 1, 1965—June 30, 1966)

The 100 companies which together with their subsidiaries received the largest dollar volume of military prime contracts of $10,000 or more in FY 1966 accounted for 63.8 percent of the U.S. total. This was 5.1 percentage points below the 68.9 percent obtained by the top 100 companies in FY 1965, and was the lowest percentage for the top 100 companies since reporting was initiated in FY 1957.

In FY 1966 awards to U.S. companies for work at home and overseas increased 38.7 percent to $33,532.6 million and the 100-company total increased 28.4 percent to $21,400.8 million. The value of $40.2 million for the company in the 100th position on the list for the current fiscal year is $16 million higher than the 100th company figure in FY 1965.

The rate of increase in FY 1966 for awards to the 100 companies lagged 10 percent behind that for total awards. At the same time small business firms increased their share of the total from 19.6 percent in FY 1965 to 21.4 percent in FY 1966.

Rank	Company	Millions of Dollars
	U. S. Total [a]	$33,532.6
	Total: 100 companies and their subsidiaries [b]	21,400.8
1.	Lockheed Aircraft Corp.	1,525.6
	Lockheed Shipbuilding & Construction Co.	5.4
	Total	1,531.0
2.	General Electric Co.	1,187.0
3.	United Aircraft Corp.	1,138.7
4.	General Dynamics Corp.	1,133.3
	Stromberg-Carlson Corp.	2.6
	United Electric Coal Co.	0.1
	Total	1,136.0
5.	Boeing Co.	914.5
6.	McDonnell Aircraft Corp.	692.3
	Conductron Corp.	7.8
	Hycon Mfg. Co.	17.5
	Tridea Electronics, Inc.	4.6
	Total	722.2
7.	American Telephone & Telegraph Co.	153.2
	Bell Tel. Co. of Pa.	[c]
	Chesapeake & Potomac Tel. Companies	7.3
	Mountain States Tel & Tel. Co.	1.6
	New England Tel. & Tel. Co.	0.6
	New Jersey Bell Tel. Co.	0.4
	New York Telephone Co.	0.2
	Northwestern Bell Tel. Co.	0.4
	Ohio Bell Telephone Co.	0.5
	Pacific Northwest Bell Tel. Co.	0.2
	Pacific Tel. & Tel. Co.	0.6
	Southern Bell Tel. & Tel. Co.	2.5
	Southwestern Bell Tel. Co.	0.9
	Teletype Corp.	18.0
	Western Electric Co., Inc.	485.7
	Total	672.1
8.	Textron, Inc.	15.4
	Accessory Products Corp.	[c]
	Bell Aerospace Corp.	532.3
	Cleveland Metal Abrasive Co.	0.1
	Delmo Victor Co.	[c]
	Durham Mfg. Co.	[c]
	Erie Tool Works	0.9
	Jones & Lamson Machine Co.	[c]
	Nuclear Metals, Inc.	[c]
	Sheaffer (W. A.) Pen Co.	[c]
	Textron Electronics, Inc.	1.5
	Textron Oregon, Inc.	4.2
	Townsend Co.	0.4
	Total	554.8
9.	Raymond International, Inc.; Morrison-Knudsen Co., Inc.; Brown & Root, Inc.; and J. A. Jones Construction Co.	547.9
10.	North American Aviation, Inc.	520.4
11.	General Motors Corp.	508.0
12.	Avco Corp.	506.0
13.	Kaiser Industries Corp.	1.0
	Kaiser Aerospace & Electronics Corp.	3.9
	Kaiser Jeep Corp.	358.4
	Kaiser Steel Corp.	42.7
	National Steel & Shipbuilding Co.	35.4
	Total	441.4
14.	Ford Motor Co.	91.7
	Philco Corp.	347.9
	Total	439.6
15.	Sperry Rand Corp.	426.9
16.	Raytheon Co.	356.1
	Amana Refrigeration, Inc.	[c]
	Dage-Bell Corp.	0.2
	Machlett Laboratories, Inc.	10.7
	Micro State Electronics Corp.	0.4
	Penta Laboratories, Inc.	0.6
	Total	368.5
17.	Westinghouse Electric Corp.	343.1
	Hagan Controls Corp.	0.1
	Thermo King Corp.	5.5
	Total	348.7
18.	Martin-Marietta Corp.	316.8
	Bunker-Ramo Corp.	20.6
	Bunker-Ramo Eastern Technical Center, Inc.	0.4
	Total	337.8
19.	Hughes Aircraft Co.	336.6
20.	General Tire & Rubber Co.	12.6
	Aerojet-Delft Corp.	0.8
	Aerojet-General Corp.	285.5
	Aerojet-General Nucleonics	1.0
	Batesville Mfg. Co.	18.4
	Fleetwood Corp.	[c]
	General Tire International Co.	0.2
	Space Electronics Corp.	[c]
	Space General Corp.	7.8
	Total	327.3
21.	Grumman Aircraft Engineering Corp.	322.0
22.	Ling-Temco-Vought, Inc.	259.0
	Continental Electronics Mfg. Co.	5.9
	Continental Electronics Systems, Inc.	0.6
	Kentron Hawaii, Ltd.	4.9
	LTV Electrosystems, Inc.	39.2
	LTV Ling Altec, Inc.	0.9
	OKonite Co.	1.0
	Total	310.8
23.	Bendix Corp.	276.1
	Beck-Lee Corp.	[c]
	Bendix Field Engineering Corp.	4.7
	Bendix-Westinghouse Automotive Air Brake Co.	0.4
	Dage Electric Co., Inc.	[c]
	Microwave Devices, Inc.	[c]
	Sheffield Corp.	0.6
	Total	281.8
24.	Douglas Aircraft Co.	278.9
25.	Northrop Corp.	182.7
	Northrop Carolina, Inc.	0.3
	Page Communications Engineers, Inc.	93.0
	Total	276.0

Rank	Company	Millions of Dollars
26.	Honeywell, Inc.	250.6
27.	Collins Radio Co.	245.3
28.	Radio Corp. of America	242.1
	RCA Defense Electronics Corp.	0.3
	Total	242.4
29.	International Telephone & Telegraph Corp.	120.3
	Barton Instrument Corp.	0.1
	Documat, Inc.	0.4
	Federal Electric Corp.	57.6
	ITT Gilfillan, Inc.	39.2
	ITT Technical Services, Inc.	1.5
	ITT Terryphone Corp.	0.2
	Jennings Radio Mfg. Corp.	0.5
	Total	219.8
30.	Litton Industries, Inc.	13.2
	Airtron, Inc.	0.1
	Analogue Controls, Inc.	[c]
	Clifton Precision Products Co., Inc.	0.2
	Ingalls Shipbuilding Corp.	46.9
	Litton Precision Products, Inc.	6.6
	Litton Systems, Inc.	152.0
	Mellonics Systems Development, Inc.	0.1
	Monroe Calculating Machine ~~Co.,~~ Inc.	0.1
	Monroe Intl., Inc.	0.1
	P S Corp.	[c]
	U.S. Engineering Co., Inc.	0.1
	Total	219.4
31.	Standard Oil Co. (New Jersey)	0.0
	American Cryogenics, Inc.	1.4
	Esso International, Inc.	129.3
	Esso Research & Engineering Co.	1.5
	Esso Standard Eastern, Inc.	17.2
	Esso Standard Oil Co. (Puerto Rico)	1.2
	Humble Oil & Refining Co.	63.4
	Total	214.0
32.	Ryan Aeronautical Co.	69.7
	Continental Aviation & Engineering Corp.	29.5
	Continental Motors Corp.	98.6
	Wisconsin Motor Corp.	1.8
	Total	199.6
33.	General Telephone & Electronics Corp.	0.0
	Automatic Electric Co.	5.6
	Automatic Electric Sales Corp.	5.1
	California Water & Tel. Co.	0.1
	General Telephone & Electronics Laboratories, Inc.	0.1
	General Tel. Co. of Fla.	[c]
	General Telephone Co. of Puerto Rico	
	General Telephone Co. of the Southeast	0.1
	Lenkurt Electric Co., Inc.	4.1
	Sylvania Electric Products, Inc.	181.3
	West Coast Tel. Co.	[c]
	Total	196.4
34.	International Business Machines Corp.	180.8
	Science Research Associates	0.1
	Service Bureau Corp.	0.7
	Total	181.6
35.	Olin Mathieson Chemical Corp.	173.0
36.	Pan American World Airways, Inc.	170.0
	Pan American Grace Airways	[c]
	Total	170.0
37.	FMC Corp.	162.5
	Gunderson Bros. Engineering Corp.	0.1
	Total	162.6
38.	du Pont (E. I.) de Nemours & Co.	20.4
	Remington Arms Co., Inc.	140.7
	Total	161.1
39.	Chrysler Corp.	150.2
40.	Standard Oil Co. (Calif.)	84.1
	California Oil Co.	0.8
	Caltex Oil Products Co.[d]	39.7
	Caltex Philippines, Inc.[d]	0.1
	Chevron Asphalt Co.	0.1
	Chevron Chemical Co.	0.3
	Chevron Oil Co.	[c]
	Community Oil Co., Inc.	0.8
	Hoffman Fuel Co., Inc.	[c]
	Independent Gasoline & Oil Co. of Rochester	[c]
	Standard Oil Co. of Kentucky	10.9
	Standard Oil Co. of Texas	4.8
	Total	141.1
41.	Goodyear Tire & Rubber Co.	50.9
	Goodyear Aerospace Corp.	78.5
	Goodyear International Co.	0.1
	Kelly-Springfield Tire Co.	[c]
	Lee Tire & Rubber Co.	0.1
	Motor Wheel Corp.	0.9
	Total	130.5
42.	Hercules, Inc.	118.6
	Haveg Industries, Inc.	1.3
	M H D Research, Inc.	0.2
	Total	120.1
43.	General Precision Equipment Corp.	0.0
	Controls Co. of America	0.3
	General Precision Decca Systems, Inc.	[c]
	General Precision, Inc.	108.1
	Graflex, Inc.	1.3
	National Theatre Supply Co.	[c]
	Strong Electric Corp.	1.8
	Tele-Signal Corp.	5.9
	Total	117.4
44.	Thiokol Chemical Corp.	110.7
45.	Norris-Thermador Corp.	110.0
	Fyr-Fyter Co.	0.6
	Total	110.6
46.	Texaco, Inc.	21.6
	Caltex Oil Products Co.[d]	39.7
	Caltex Philippines, Inc.[d]	0.1
	Jefferson Chemical Co., Inc.	0.4
	Paragon Oil Co.	1.1
	Texaco Caribbean, Inc.	0.1
	Texaco Experiment, Inc.	3.2
	Texaco Export, Inc.	38.3
	Texaco Puerto Rico, Inc.	0.4
	Texaco Trinidad, Inc.	0.1
	White Fuel Co., Inc.	0.7
	Total	105.7
47.	Signal Oil and Gas Co.	5.9
	Garrett Corp.	97.9
	Southland Oil Corp.	0.5
	Space Petroleum Corp.	1.1
	Total	105.4
48.	T R W, Inc.	103.6
49.	Lear-Siegler, Inc.	89.0
	American Avitron, Inc.	0.4
	Astek Instrument Corp.	0.4
	Cimron Corp.	0.1
	Hokanson, (C. G.) Co., Inc.	0.6
	Lear-Siegler Service, Inc.	7.5
	Total	98.0
50.	Mobil Oil Corp.	97.7
51.	Eastman Kodak Co.	94.2
	Eastman Kodak Stores, Inc.	1.6
	Recordak Corp.	0.7
	Total	96.5
52.	Bethlehem Steel Corp.	89.9
	Bethlehem Steel Export Corp.	0.9
	Calmar Steamship Corp.	1.3
	Total	92.1

Rank	Company	Millions of Dollars
53.	Curtiss-Wright Corp.	91.1
54.	Asiatic Petroleum Corp.	88.0
55.	Colt Industries, Inc.	4.5
	Chandler Evans, Inc.	12.1
	Colt's Inc.	0.1
	Colt's Patent Fire Arms Mfg. Co., Inc.	63.4
	Fairbanks Morse, Inc.	4.6
	Pratt & Whitney, Inc.	1.9
	Total	86.6
56.	Magnavox Co.	83.5
57.	Harvey Aluminum, Inc.	32.6
	Harvey Aluminum Sales, Inc.	49.8
	Total	82.4
58.	Aerospace Corp.	80.4
59.	Fairchild Hiller Corp.	80.1
60.	International Harvester Co.	73.1
	Hough (Frank G.) Co.	1.7
	MacLeod & Co.	2.8
	Total	77.6
61.	Sanders Associates, Inc.	77.1
62.	Stevens (J. P.) & Co., Inc.	75.8
63.	Firestone Tire & Rubber Co.	73.9
	Dayton Tire & Rubber Co.	0.6
	Total	74.5
64.	United States Rubber Co.	74.5
	Masland Duraleather Co.	c
	U.S. Rubber International Corp.	c
	Total	74.5
65.	United States Steel Corp.	69.5
	Reactive Metals, Inc.	c
	Total	69.5
66.	American Electric, Inc.	68.6
67.	Chamberlain Corp.	67.4
68.	Teledyne, Inc.	62.3
69.	Hupp Corp.	61.6
70.	Condec Corp.	56.6
	Consolidated Avionics Corp.	c
	Consolidated Controls Corp.	0.4
	Total	57.0
71.	American Machine & Foundry Co.	55.4
	Cuno Engineering Corp.	0.7
	Voit (W. J.) Rubber Corp.	0.2
	Total	56.3
72.	Motorola, Inc.	50.0
	Motorola Communications & Electronics, Inc.	5.0
	Motorola Overseas Corp.	c
	Total	55.0
73.	Western Union Telegraph Co.	54.9
74.	Day & Zimmerman, Inc.	54.1
75.	Sverdrup & Parcel, Inc.	c
	ARO, Inc.	52.3
	Total	52.3
76.	Union Carbide Corp.	48.5
	Englander Co., Inc.	0.1
	Korad Corp.	1.1
	Ocean Systems, Inc.	2.1
	Union Carbide Internat'l., Inc.	c
	Total	51.8
77.	Newport News Shipbuilding & Dry Dock Co.	51.5
78.	Mass. Institute of Tech.	50.7
79.	Vitro Corp. of America	49.3
	Vitro Minerals & Mining Corp.	1.2
	Total	50.5
80.	Burlington Industries, Inc.	36.4
	Cleveland Woolens	2.4
	Erwin Mills, Inc.	11.7
	Klopman Mills, Inc.	c
	Total	50.5
81.	Johns Hopkins University	50.5
82.	Caterpillar Tractor Co.	47.0
	Towmotor Corp.	2.5
	Total	49.5
83.	General Time Corp.	48.0
84.	Texas Instruments, Inc.	47.2
	Metals & Controls, Inc.	c
	Total	47.2
85.	National Presto Industries	46.5
86.	Westinghouse Air Brake Co.	1.2
	Failing (George E.) Co.	0.3
	Le Tourneau-Westinghouse Co.	16.2
	Melpar, Inc.	18.0
	Wilcox Electric Co., Inc.	8.3
	Total	44.0
87.	Flying Tiger Line, Inc.	43.6
88.	American Manufacturing Co. of Texas	43.4
89.	Emerson Electric Co.	42.8
	Rantec Corp.	0.1
	Total	42.9
90.	Atlantic Research Corp.	41.7
	Northeastern Engineering, Inc.	0.1
	Total	41.8
91.	Clark Equipment Co.	41.7
92.	Universal American Corp.	1.2
	Amron Corp.	40.4
	Von Kohorn-Universal Corp.	c
	Total	41.6
93.	Control Data Corp.	35.8
	Control Corp.	0.1
	Data Display, Inc.	c
	Datatrol Corp.	0.3
	Rabinow Electronics, Inc.	0.[illegible]
94.	System Development Corp.	40.[illegible]
95.	Burroughs Corp.	40.[illegible]
	Burroughs Control Corp.	0.[illegible]
	Total	40.[illegible]
96.	Hayes International Corp.	40.[illegible]
97.	Bowen-McLaughlin-York, Inc.	40.5
98.	Dow Chemical Co.	39.6
	Dow Corning Corp.	0.6
	Total	40.2
99.	Borg-Warner Corp.	34.4
	Morse Chain Co.	c
	York Corp.	5.8
	Total	40.2
100.	Continental Oil Co.	32.3
	American Agricultural Chemical Co.	c
	Douglas Oil Co. of Calif.	0.8
	Western Oil & Fuel Co.	1.1
	Total	40.2

Footnotes

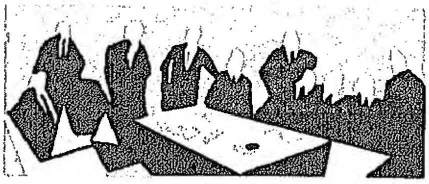
[a] Net value of new procurement actions minus cancellations, terminations and other credit transactions. The data include debit and credit procurement actions of $10,000 or more, under military supply, service and construction contracts for work in the United States plus awards to listed companies and other U.S. companies for work overseas.

Procurement actions include definitive contracts, the obligated portions of letter contracts, purchase orders, job orders, task orders, delivery orders, any other orders against existing contracts. The data do not include that part of indefinite quantity contracts that have not been translated into specific orders on business firms, nor do they include purchase commitments or pending cancellations that have not yet become mutually binding agreements between the Government and the company.

[b] The assignment of subsidiaries to parent companies is based on stock ownership of 50 percent or more by the parent company, as indicated by data published in standard industrial reference sources. The company totals do not include contracts made by other U.S. Government agencies and financed with DOD funds, or contracts awarded in foreign nations through their respective governments. The company names and corporate structures are those in effect as of June 30, 1966. Only those subsidiaries are shown for which procurement actions have been reported.

[c] Less than $50,000.

[d] Stock ownership is equally divided between Standard Oil Co. of California and Texaco, Inc.; half of the total of military awards is shown under each of the parent companies.



MEETINGS AND SYMPOSIA

JANUARY

Mission of Navy Laboratories—Washington Area Briefing (Classified), at Naval Research Laboratory, Washington, D.C., Jan. 19. Sponsor: Washington Chapter of American Ordnance Assn. Contact: J. T. Ticer, Atlantic Research Corp., Alexandria, Va.

Fifth Aerospace Sciences Meeting, Jan. 23–25, at Statler-Hilton Hotel, New York, N.Y. Sponsor: American Institute of Aeronautics and Astronautics. Contact: Jack Nielsen, General Chairman, P.O. Box 642, Los Altos, Calif. 94022.

Symposium on Circuit Design by Computer, Jan. 30–31, at New York University, Bronx, N.Y. Sponsor: Office of Naval Research. Contact: Cdr. D. D. Kilpatrick, USN, Office of Naval Research, Department of the Navy, Washington, D.C. 20360, (Area Code 202) OXford 6-3082.

Second Annual Symposium on Non-Destructive Testing of Welds, Jan. 30–Feb. 2, at Chicago, Ill. Sponsor: Illinois Institute of Technology. Contact: T. F. Drouillard, ITT Research Institute, 10 West 35th St., Chicago, Ill. 60616.

FEBRUARY

Winter Convention on Aerospace and Electronic Systems, Feb. 7–9, at International Hotel, Los Angeles, Calif. Sponsor: Institute of Electrical and Electronics Engineers (IEEE). Contact: IEEE, 345 East 47th St., New York, N.Y. 10017.

Institute of Navigation 1967 National Air Meeting on Collision Avoidance, Feb. 23–24, at Dayton, Ohio. Sponsor: Institute of Navigation. Contact: Capt. Ross E. Freeman, USN (Ret.), Executive Director, Institute of Navigation, Suite 912, 711 14th St., N.W., Washington, D.C. 20005, (Area Code 202) 783-3296.

Systems Effectiveness Conference, Feb. 28–March 1, at Statler-Hilton Hotel, Los Angeles, Calif. Sponsor: Electronic Industries Assn. Contact: Robert E. Redfern, Electronic Industries Assn., 2001 Eye Street, N.W., Washington, D.C. 20006

MARCH

Syposium on Modern Optics, March 22–24 (revised date), New York City. Sponsors: Air Force Office of Scientific Research, Office of Naval Research and Army Research Office. Contact: Lt. Col. E. P. Gaines Jr., (SREE), Air Force Office of Scientific Research, Tempo D, 4th and Independence Ave., S.W., Washington D.C. 20333, (Area Code 202) OXford 6-3671.

APRIL

Biomechanics Symposium, April 5–6, at Augustana College, Rock Island, Ill. Sponsors: Rock Island Army Arsenal, Army Weapons Command, Army Research Office-Durham and Augustana College. Contact: Prof. John E. Ekblad, Augustana College, Rock Island, Ill. 61201.

Annual Frequency Control Symposium, April 24–26, at the Shelburne Hotel, Atlantic City, N.J. Sponsor: Army Electronics Command. Contact: Director, Electronic Components Laboratory, Army Electronics Command, Attn: AMSEL-KL-SR (Mr. M. F. Timm), Fort Monmouth, N.J. 07703, (Area Code 201) 535-2826 or 535-1728

AMC Gets Instant Procurement Information Computer

A computer-equipped system which provides instant information on procurement actions throughout the Army Materiel Command (AMC) has been inaugurated at the Army Electronics Command, Fort Monmouth, N.J.

When in full operation the system, called Standard Work Ordering and Reporting Data System (SWORDS), will establish a data bank of contractual information at every AMC installation involved in providing or using work ordering service.

Another function of the system provides instant communication between all AMC elements and the Defense Contract Administration Services on daily procurement actions. Information on the actions can be fed into one installation's computer by magnetic tape or punch cards and be immediately available at the others.

Two New DCASO's Established

The Defense Supply Agency (DSA) has established new Defense Contract Administration Services Offices (DCASO's) in Orlando, Fla., and Huntsville, Ala.

A DCASO located at The Martin Co., P. O. Box 5837, Orlando, Fla. 32805, will administer contracts at the Martin plant. The Martin plant is currently producing on several major DOD systems including the Sprint, Walleye, Bullpup and Pershing weapon systems.

The Huntsville DCASO, located at 2109 W. Clinton St., Huntsville, Ala. 35805, will administer both National Aeronautics and Space Administration (NASA) and DOD contracts in the heavily industrialized area in and around Huntsville. NASA contracts will comprise the bulk of the new DCASO's contracts.

Both new offices are part of the Defense Contract Administration Services Region, Atlanta.

USAF Develops Tiny Image Storing Device

A device that theoretically could store an entire motion picture the size of "Gone With the Wind" on one crystal no bigger than a sugar cube has been developed by Air Force Systems Command bionics scientists at Wright-Patterson AFB, Ohio.

The experimental model uses a helium neon laser to bleach a photographic slide onto the purple-colored, potassium bromide crystal. By turning the crystal slightly, another image can be recorded. Incremental changes would permit storage of several hundred thousand items.

Air Force Avionics Laboratory, a unit of Systems Command's Research and Technology Division, developed the process which is officially called a Multiple Image Storage Device.

By removing the eyepiece from a microscope focused on 35mm slides stored on the crystal, images can be crudely displayed on a projection screen.

The device is basically one of several bionics-type endeavors to duplicate the high-density "packaging" of nature—typified in the human brain, which has about 10 billion neurons, or nerve cells.

Thus far only two dimensional slides of writing or objects have been bleached onto the crystal. Future experimentation will be directed toward storing three dimensional or hologram-type slides and improving the methods of removing slides from the crystal.

1966 Omnibus Act Authorizes Civil Works Projects

The Omnibus Rivers and Harbors and Flood Control Act of 1966 authorizes the Army Corps of Engineers to construct, modify, or otherwise participate in the provision of 42 flood control, navigation, water conservation and other water resources projects, having an estimated Federal cost of $670,235,000.

This includes 27 flood control (including multiple-purpose) projects at a cost of $645,352,000; 11 navigation projects at an estimated Federal cost of $17,872,000; and four beach erosion projects at an estimated Federal cost of $7,011,000. The act authorizes 12 surveys for flood control and allied purposes and two surveys in the interest of navigation and beach erosion control.

The new Omnibus Act also raises the yearly limit of $2,500,000 authorized by the Flood Control Act of 1960, as amended, for flood plain information studies and advice on flood plain management to $7,000,000.

A listing of new construction and other authorizations with description and estimated Federal cost, where appropriate, follows. The initials before the project descriptions indicate: N (navigation); FC (flood control); BE (beach erosion control); MP (multiple-purpose), and HFC (hurricane flood control).

(Legend. The sequence of the listing is as follows: 1. Location. 2. Description of project. 3. Dollar amount of Federal cost.)

ARKANSAS

Bayou Bartholomew. (FC) Levees and small reservoirs. $9,360,000.

CALIFORNIA

Klamath River. (FC) Levees for flood protection of Klamath and Klamath Glen. $2,460,000.

Pajaro River. (FC) Levees and channel improvements. $11,890,000.

Russian River. (FC) Reservoir at Knights Valley; diversion dam and pumping plant. $166,800,000.

San Diego (Sunset Cliffs). (BE) Shore protection works. $809,000.

Yuba River. (MP) Marysville Reservoir. $132,900,000.

CONNECTICUT

Pequonnock River Basin. (MP) Trumbull Reservoir. $5,000,000.

FLORIDA

Gulf County Canal. (N) Shallow draft channel. $477,000.

Mullet Key. (BE) Shore protection. $286,000.

Pinellas County. (BE) Shore protection works. $116,000.

St. Lucie Inlet. (N) Channel maintenance and navigation aids.

GEORGIA

Savannah River. (MP) Trotters Shoals Reservoir. $84,900,000.

IDAHO

Boise River and tributaries, vicinity of Boise. (FC) Cottonwood Creek and Stuart Gulch Reservoirs. $1,576,000.

IOWA

Mississippi River—Fort Madison Harbor. (N) Access channel and maneuvering area. $975,000.

KENTUCKY

Little Sandy River and Tygarts Creek. (MP) Kehoe Reservoir. $15,000,000.

Salt River. (MP) Taylorsville Reservoir. $24,800,000.

LOUISIANA

Ouachita River at Monroe. (FC) Authorize maximum flood protection Plan "B." $1,160,000.

Teche-Vermilion Basins. (FC) Diversion of water from Atchafalaya River to Teche-Vermilion basins. $5,100,000.

Baton Rouge. (FC) Bank revetment.

MASSACHUSETTS

North Nashua River Basin. (FC) Monoosnoc Brook, Nookagee, Whitmanville and Phillips Reservoirs; channel improvements. $15,816,000.

Sudbury River at Saxonville. (FC) Local flood protection. $1,300,000.

MICHIGAN

Cross Village Harbor. (N) Breakwaters, anchorage and maneuvering area, channel improvements, and recreational fishing facility. $723,000.

MISSISSIPPI

Biloxi River. (N) Channel deepening and widening. $753,000.

Pearl River. (N) Cutoffs and easement of bends in West Pearl River. $630,000.

MISSOURI

Meramec River. (FC) Pine Fo[rk,] Irondale and I-38 Reservoirs; a[nd] use sites for recreational areas a[nd] facilities. $45,971,000.

Mississippi River-Agricultur[al] Areas—Mile 195 to Mile 300 ab[ove] Ohio River. (FC) Levees and pumpi[ng] plants. $7,193,000.

NEW JERSEY

Newark Bay, Hackensack and Pa[s]saic Rivers. (N) Deep draft chann[el] improvements and maneuvering area[s] for Newark Bay; shallow draft channel improvements for Hackensack River. $12,899,000.

NEW YORK

Red Creek, Monroe County. (FC) Local flood protection. $1,430,000.

NORTH CAROLINA

Beaufort Inlet to Bogue Inlet. (HFC) Dikes and drainage structures. $320,000.

Bogue Inlet to Moore Inlet. (HFC) Shore protection works for Topsail Beach and Surf City. $1,249,000.

Cape Fear River to North Carolina and South Carolina state line. (HFC) Shore protection works for Youpon, Long, Holden, Ocean Isle and Sunset Beaches. $12,310,000.

Mainland Areas, N.C. (HFC) Earthen dike with drainage and navigation structures. $2,048,000.

Ocracoke Inlet to Beaufort Inlet. (BE) Shore protection works. $5,800,000.

Carolina Beach Harbor. (N) Maintenance of harbor channels.

Southport Harbor. (N) Maintenance of channel turning basin for small boat harbor.

Outer Banks-Virginia state line to Hatteras Inlet. (HFC) Shore protection works for Kitty Hawk, Kill Devil Hills and Nags Head. $6,052,000.

OHIO

Conneaut Harbor. (N) Shallow draft navigation and recreational improvements. $495,000.

Maumee River at Ottawa. (FC) Local flood protection. $3,413,000.

PENNSYLVANIA

Elk Creek Harbor. (N) Shallow draft navigation and recreational improvements. $920,000.

TEXAS

Arkansas and Red Rivers, water quality control, Part I. (FC) Wichita River project to control natural

(Continued Inside Back Cover)

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DOD Directives and Instructions:
Publication Distribution Branch
Office of the Secretary of Defense
Room 3B 200, The Pentagon
Washington, D.C. 20301

Defense Procurement Circulars:
Distribution is made automatically to subscribers of the Armed Services Procurement Regulation by the Government Printing Office Office.

Research Reports:
Authorized DOD contractors and grantees may obtain these documents without charge from:
Defense Documentation Center
Cameron Station
Alexandria, Va. 22314
Others may purchase these documents at the price indicated from:
Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

DOD Directives and Instructions

DOD Directive, 5160.57, "Electromagnetic Compatibility Analysis Center (ECAC)," Sept. 23, 1966. Prescribes the mission, functions, responsibilities, operational relationships, and the management arrangement for the joint DOD Electromagnetic Compatibility Analysis Center.

DOD Instruction 5210.51, "Security Classification Concerning Airborne Passive Scanning Infrared Imaging Systems," Oct. 25, 1966. Prescribes uniform standards and criteria for classifying information pertaining to certain airborne passive infrared imaging systems; levels of capability of such imaging systems at and below which operating data can be disclosed without jeopardizing national defense; and general guidance governing the issuance of specific classification guides for individual imaging systems.

DOD Instruction 5410.15, "Delineation of DOD Audio-Visual Public Affairs Responsibilities and Policies," Nov. 3, 1966. Delineates DOD responsibilities and policies on releasing DOD-generated audio-visual material to the public and furnishing assistance to non-Government agencies involved in the production of audio-visual materials insofar as they help sustain public understanding of DOD.

Defense Procurement Circulars

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The Synthesis of Special Fluorine-Containing Monomers. University of Colorado, for the Army, Jan. 1966, 117 p. Order No. AD-636 217. $4.

Geometrical Effects of Filament Twist on the Modulus and Strength of Graphite Fiber Reinforced Composites. Air Force Materials Laboratory, Sept. 1966, 18 p. Order No. AD-638 299. $1.

Localized Necking in Anisotropic Titanium Sheet Tensile Specimens. Army Materials Research Agency, July 1966, 17 p. Order No. AD-638 298. $1.

Effect of Tungsten Composition on the Mechanical Properties of the W-Ni-Fe Heavy Alloy. M.I.T., for the Air Force, Sept. 1966, 37 p. Order No. AD-638 620. $2.

The Operation of Brittle Fracture Mechanisms in Ductile Metal Composites. M.I.T., for the Air Force, Sept. 1966, 24 p. Order No. AD-638 621. $1.

Report on the Mechanical and Thermal Properties of Tungsten and TZM Sheet Produced in the Refractory Metal Sheet Rolling Program—Part I. Southern Research Institute, Birmingham, Ala., for the Navy, Aug. 1966, 200 p. Order No. AD-638 631. $5.

Irig Standard Coordinate System and Data Formats for Antenna Patterns. White Sands Missile Range, N.M., May 1966, 106 p. Order No. AD-637 189. $4.

Noise Measurements as a Tool in Electron Device Research. University of Minnesota, for the Army, Sept. 1966, 204 p. Order No. AD-638 297. $6.

Application of Computers to RF Circuit Design, Final Report. Applied Technology, Inc., Palo Alto, Calif., for the Army, Sept. 1966, 133 p. Order No. AD-637 600. $4.

Microwave Semiconductor Oscillator and Amplifier. Army Electronics Command, Fort Monmouth, N.J., Aug. 1966, 31 p. Order No. AD-638 729. $2.

Preparation of Thin-Film Tunneling Structures. Army Electronics Command, Fort Monmouth, N.J., Aug. 1966, 28 p. Order No. AD-638 416. $2.

Micro-Notes, Information on Microelectronics for Navy Equipment. Naval Air Systems Command, Sept. 1966, 86 p. AD-639 091. $3.

A Temperature Compensating Preamplifier for Driving Long Coaxial Lines in Scintillation Spectroscopy Applications. Naval Radiological Defense Laboratory, San Francisco, Calif., Aug. 1966, 38 p. Order No. AD-635 882. $2.

The Preparation of Oriented Single Crystal Spheres of Intermetallic Compounds Between the Rare Earth and Iron Group Metals. Perkin-Elmer Corp., Norwalk, Conn., for the Air Force, Sept. 1966, 32 p. Order No. AD-637 803. $2.

Quartz Crystal Units for Very High Frequencies. Army Electronics Command, Fort Monmouth, N.J., April 1966, 21 p. Order No. AD-634 447. $1.

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High-Yield Reactions to Introduce Aldehyde Groups into Pyridine Derivatives. Ash Stevens Inc., Detroit, Mich., for the Army, May 1966, 61 p. Order No. AD-635 119. $1.50.

Some Exploratory Experiments on Laser Explosions in Pseudo-Air. Naval Ordnance Laboratory, White Oak, Md., March 1966, 31 p. Order No. AD-632 484. $2.

High-Current Pulse Generator for Gallium Arsenide Laser. Army's Harry Diamond Laboratories, Washington, D.C., April 1966, 14 p. Order No. AD-634 507. $1.

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The Investigation of the Preparation and Evaluation of High Purity Elemental Boron. Eagle-Picher Industries, Miami, Okla., for the Air Force, Aug. 1966, 78 p. Order No. AD-639 646. $3.

U.S.-German Cooperation Includes Field of Logistics

by
Hugh J. Gownley

From the early days of the reactivation and buildup of the modern German armed forces in 1956, discerning defense authorities, both German and American, became acutely aware of the importance of cooperative logistics to support, on a sustained basis, the men and weapons associated with the buildup of viable North Atlantic Treaty Organization (NATO) defense forces. As the NATO armed forces grew, many German and American officials became painfully aware that, while money could be provided to buy modern and sophisticated weapons, it was not as easy to provide for the support necessary to maintain an operationally ready force.

In the spring of 1961, with the knowledge that international logistics cooperation was not a reality, DOD officials approached the Ministry of Defense of the Federal Republic of Germany (FRG) and proposed that the United States provide logistics assistance to the Federal Republic. This proposal was made because U.S. military authorities recognized that lack of modern equipment and logistics support for German divisions fighting alongside U.S. divisions created a situation which was not militarily acceptable to either Germany or the United States.

The proposal was found to be most interesting to the German government. During the spring and summer of 1961, therefore, a series of joint conferences was held to determine specifically the kinds of logistics support that the Federal Republic of Germany needed and which the United States could provide. The work accomplished in these joint conferences led ultimately to the first Cooperative Logistics Agreement between Germany and the United States in October 1961. Through this agreement, the United States was to provide logistics assistance in the fields of procurement services, depot supply support, depot maintenance, training, storage and provision of emergency medical services. The agreement was reaffirmed in September 1962 and in May 1964 by Secretary McNamara and Minister van Hassel. The latter agreement covered the years 1965–1966.

What has been accomplished by the aforementioned agreements is unique in military history. At no time in the past have two sovereign nations wedded their military logistics systems to the point where support is provided on an equal basis. To understand the real meaning of this cooperative support, however, one must look at some of the specific areas involved.

Supply Support. Supply support for most of the U.S.-produced major Army weapon systems in the German Army's inventory is accomplished through the U.S. Army supply system in the continental United States and in Europe. This means that German Army requisitions prepared on U.S. forms are dispatched electronically into the U.S. Army system and are processed in the same manner as requisitions from the U.S. Army units. Materiel to fill these requisitions is procured, shipped, stored and issued from U.S. Army depots, again in the same fashion as materiel is handled for U.S. Army units. There is no segregation of stock for German or American customers and in every respect German Army units enjoy the same degree of support as is given American units of equal priority. Support for the German Navy and German Air Force has been developed (although in lesser volume) along comparable lines. These significant statistics illustrate the past and future accomplishments in this area:

Hugh J. Gownley is Dep. for Management to the Dep. Asst. Secretary of Defense (International Logistics Negotiations), Office of Asst. Secretary of Defense (International Security Affairs). He also supervises the activities of the Federal Republic of Germany, European and Latin American Directorates.

- Line items of requisitions processed FY 1961–66: 181,441
- Line items of requisitions estimated FY 1967–70: over 200,000

Training Support. The need for adequate training space has been a continuing concern to the German armed forces. The United States has been sharing training time at German installations and has operated some of its major training facilities in the United States for the German Army and Air Force. Some of the significant facts in this area are:

- Over 2,000 Air Force students have been trained in the United States in the last five years with many more to come.
- Almost 16,000 Army technical students were trained in the United States with 10,000 planned for the future.
- Over 3,000 Naval students were trained in the United States with 2,000 more planned for the future.
- Over 961 battalion weeks of training time was provided to the German Army at U.S. training areas in Europe with over 1,500 planned for the future.

Procurement Support. Another significant logistic service which the United States performs for the Federal Republic of Germany involves procurement support. The Germans have asked for this procurement assistance because they do not have the personnel to administer the very large volume of German defense materiel purchased in the United States. The kinds of procurement services, in addition to contract negotiation are: audit services, inspection, quality control, and the acquisition of appropriate publications or manuals. Some interesting statistics in this area include:

- Over 4,000 man years of procurement, audit, contract and other types of services have been provided.
- Over 3,000 man years are planned for the future.

Maintenance Support. U.S. Army depot maintenance facilities in Germany are now used to overhaul, repair and rebuild American equipment held by German forces. The maintenance requirements of the Germany Army are programmed in advance along with U.S. requirements so that German and U.S. equipment can be seen passing through the same overhaul line in a U.S. facility, receiving the same quality of repair and timely return to the users. Facts worth noting include the following:

- Over 50 major types of Army equipment are maintained by U.S. facilities for the German Army.
- Complete shipyard support is provided for German Naval destroyers of an American type.
- Almost 2,000,000 man hours of maintenance time has been provided to the German Army by U.S. forces.
- Over 2,500,000 man hours are planned for the future.

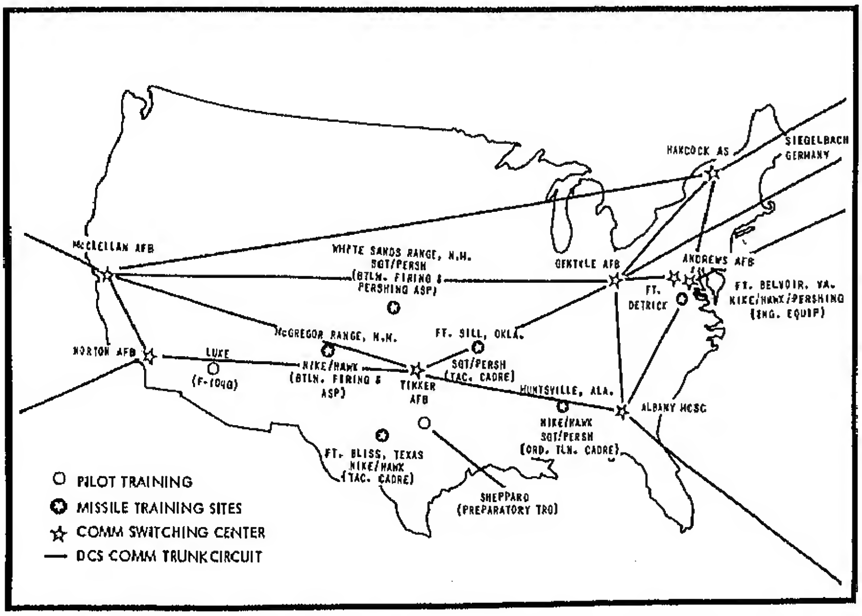
Storage, Administration and Training Space. A separate procedural arrangement has been instituted for the joint utilization of facilities belonging to the United States which can be put at the disposal of the German armed forces. Requirements expressed by the Federal Republic of Germany are reviewed by the U.S. European Command, available space is identified, offers and acceptances are exchanged with Germany, and specific agreements are then negotiated. A significant statistic in this area is:

- Over 500,000 square feet of space is shared with Germany at U.S. facilities in Europe.

Research and Development Cooperation. A cooperative research and development program, bringing together the top engineers and scientists of both countries, has been developed. This cooperation involved:

- Development of a new main battle tank for the 1970's with over $150 million of development cost shared by the two countries.
- Studies of vertical take-off and short take-off aircraft for the 1970's with the cost of these studies shared by both countries.
- Over 115 technical data exchange agreements by which the United States provides technical data to Germans on subjects covering military technology.

Today, in Germany, five U.S. divisions, together with 12 German divisions, constitute the principal NATO deterrent against any aggression from the East. This combined force is made significantly stronger by the support provided by the cooperative logistic system that has been developed during the past five years. Germany and the United States have shown that cooperation in logistics can work effectively—and all of NATO is the beneficiary of this successful endeavor.



LOGISTICS COOPERATION WITH GERMANY IN THE UNITED STATES

Laser Memory Device Developed by USAF Scientists

Scientists of the Air Force Systems Command's Research & Technology Div. (RTD) have developed a laser beam device to serve as the "memory" for experimental electronic systems that could some day fly an aircraft or control satellite missions.

Called an Optical Maze Runner, it is one of several efforts in RTD's Air Force Avionics Laboratory at Wright-Patterson AFB, Ohio, to apply knowledge gained of living things to the solution of engineering problems. The maze runner is modeled after biological nerve patterns that store huge amounts of information for learning and decision.

In theory, it could be compared to a game of Parcheesi, with the sole "player" being a laser beam and with the part from "start" to "home" printed on a crystal about the size of a matchbook.

To make sure the laser always "wins," Air Force scientists have stored 40,000 pieces of information, coded as right or wrong moves, on the purple-colored crystal.

The device could replace more complicated memory systems used in some types of equipment. One of the advantages of using a laser beam as a maze runner is the ease involved in switching it off and on merely by interrupting the microscopic beam.

The storage crystal, made of potassium bromide impregnated with hydrogen, is divided into four equal sections. Coded on one of these is the maze which offers four directional choices: left, right, up and down.

Searching for correct information, or "ways out," the laser scans these choices much as a person walks through hallways to get out of a building. Two other sections of the crystal record successful paths; the fourth is a history of all points that have been encountered.

The light source is supplied by two helium neon lasers—one in the red spectrum, the other in the infrared—which are split, then focused over the crystal sections in a parallel arrangement.

Information is put on or taken off the crystal at the rate of one piece of information a thousandth of a second. The technique used is similar to the way some sunglasses change color when exposed to different intensities of light. When a laser in the red spectrum is directed onto the crystal, it bleaches out a small spot. If the information needs to be erased, an infrared beam re-colors the spot purple.

Carson Laboratories of Bristol, Conn., built the device under an Air Force contract with the Avionics Laboratory.

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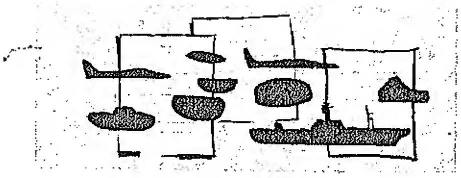

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of November 1966:

DEFENSE SUPPLY AGENCY

1—U.S. Rubber Co., Washington, Ind. $2,517,577. 242,480 pairs of men's wet weather overalls. Defense Personnel Support Center, Philadelphia, Pa.

—J. M. Bachelmer, Frederick, Md. $1,590,457. 948,280 field pack suspenders. Defense Personnel Support Center, Philadelphia, Pa.

2—Watts Mfg. Co., Compton, Calif. $2,520,700. 5,000 large general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—Coastal States Petrochemical Co., Houston, Tex. $1,787,919. 16,800,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—Union Oil Co. of Calif., Los Angeles, Calif. $1,335,600. 12,600,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—Cities Service Oil Co., New York City, N.Y. $1,142,326. 10,500,000 gallons of JP-4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

8—Pettibone Mulliken Corp., Washington, D.C. $2,308,037. 129 six-thousand lb capacity, rough terrain fork lift trucks and 129 sets of technical manuals. Defense General Supply Center, Richmond, Va.

—Major Clothing Co., Bridgeton, N.J. $2,000,260. 45,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

—General Cable Corp., New York City, N.Y. $2,055,552. 88,400 reels of field wire telephone cable. Defense Industrial Supply Center, Philadelphia, Pa.

—South Wire Co., Carrollton, Ga. $1,596,000. 86,000 reels of field wire telephone cable. Defense Industrial Supply Center, Philadelphia, Pa.

4—Guy H. James Industries, Midwest City, Okla. $1,280,000. 1,000,000 men's cotton sateen shirts. Defense Personnel Support Center, Philadelphia, Pa.

9—Riegel Textile Corp., New York City, N.Y. $1,736,848. 1,639,000 yds of wind-resistant cotton oxford cloth. Defense Personnel Support Center, Philadelphia, Pa.

—C. M. London Co., New York City, N.Y. $1,515,100. 1,390,000 yds of wind-resistant cotton oxford cloth. Defense Personnel Support Center, Philadelphia, Pa.

10—Hart, Schaffner & Marx, Chicago, Ill. $1,509,480. 42,000 men's polyester and wool tropical coats. Chicago. Defense Personnel Support Center, Philadelphia, Pa.

14—Ashby Corp., St. Louis, Mo. $4,149,000. 800,000 folding canvas cots. Defense General Supply Center, Richmond, Va.

15—Top Co., Boston, Mass. $1,280,200. 770,839 lbs. of wool combings. Defense Personnel Support Center, Philadelphia, Pa.

17—Collyer Insulated Wire Co., Lincoln, R.I. $2,390,425. 6,418,000 feet of shipboard cable. Defense Industrial Supply Center, Philadelphia, Pa.

—Plastoid Corp., Hamburg, N.J. $3,787,653. 13,338,000 feet of shipboard cable. Defense Industrial Supply Center, Philadelphia, Pa.

—General Cable Corp., Havertown, Pa. $2,173,180. 1,123,600 feet of various types of shipboard cable. Defense Industrial Supply Center, Philadelphia, Pa.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or work to be Performed—Location Work Performed—Contracting Agency.

—International Nickel Co., Huntington, W. Va. $1,682,975. Various sizes of nickel copper alloy. Defense Industrial Supply Center, Philadelphia, Pa.

18—J. P. Stevens & Co., New York City, N.Y. $2,853,936. 1,662,000 linear yds of cotton and nylon oxford cloth. Defense Personnel Support Center, Philadelphia, Pa.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP-5 jet fuel:
Humble Oil & Refining Co., Houston, Tex. $6,872,040. 75,600,000 gals.
Mobil Oil Corp., New York City, N.Y. $5,221,356. 55,084,120 gals.
Gulf Oil Corp., New York City, N.Y. $3,075,300. 42,000,000.
Sun Oil Corp., Philadelphia, Pa. $2,495,505. 25,200,000 gals.
Edgington Oil Refineries, Long Beach, Calif. $1,696,125. 13,750,000 gals.
Golden Eagle Refining Co., Los Angeles, Calif. $1,509,600. 13,000,000 gals.
Marathon Oil Co., New York City, N.Y. $1,464,330. 15,960,000 gals.
Union Oil Co. of Calif., Los Angeles, Calif. $1,261,209. 11,424,000 gals.

21—Sportwelt Shoe Co., Nashua, N.H. $1,455,339. 119,388 pairs of combat boots. Defense Personnel Support Center, Philadelphia, Pa.

—Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for petroleum products:
Texaco Export, Inc., New York City, N.Y. $3,733,500. 1,900,000 barrels of Navy Special.
Atlantic Richfield Co., Los Angeles, Calif. $2,310,500. 900,000 barrels of Navy Special.
Texaco, Inc., New York City, N.Y. $1,280,100. 510,000 barrels of Navy Special.
Standard Oil Co. of California, San Francisco, Calif. $1,246,490. 170,000 barrels of Combat Type II and 75,000 barrels of Combat Type I (gasoline).
Edgington Oil Refineries, Inc., Long Beach, Calif. $1,200,500. 45,000 barrels of Navy Special.
Texas City Refining Co., Texas City, Tex. $1,127,500. 300,000 barrels of Diesel Marine.
Golden Eagle Refining Co., Los Angeles, Calif. $1,097,900. 410,000 barrels of Navy Special.
Union Oil Co. of California, Los Angeles, Calif. $1,104,600. 140,000 barrels of Arctic diesel fuel oil and 130,000 barrels of grade DF-1 diesel fuel oil.
American Oil Co., Chicago, Ill. $2,101,580. Fuel oil and gasoline.
Gulf Oil Corp., Houston, Tex. $1,557,878. Fuel oil and gasoline.
Mobil Oil Corp., New York City, N.Y. $1,167,002. Fuel oil and gasoline.

22—The Defense Personnel Support Center, Philadelphia, Pa., has awarded the following contracts for men's black oxford dress shoes:
Genesco, Inc., Nashville, Tenn. $2,816,280. 860,000 pairs.
Cumberland Shoe Corp., Franklin, Tenn. $1,929,600. 240,000 pairs.
Endicott-Johnson Co., Endicott, N.Y. $2,896,680. 286,000 pairs.
J. F. McElwain Co., Nashua, N.H. $2,277,000. 300,000 pairs.
International Shoe Co., St. Louis, Mo. $1,263,291. 148,044 pairs.

—Milcom Products, Inc., Rochester, N.Y. $1,064,023. 602,432 men's belts. Defense Personnel Support Center, Philadelphia, Pa.

—Wales Mfg. Co., Boston, Mass. $1,057,500. 25,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

23—Johnson & Johnson, New Brunswick, N.J. $1,697,366. 1,789,765 packages of surgical sponges. Defense Personnel Support Center, Philadelphia, Pa.

25—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP-4 jet fuel:
Debco Corp., Abilene, Tex. $6,182,828. 59,852,200 gallons.
Bell Oil & Gas Co., Bartlesville, Okla. $3,527,737. 37,555,000 gallons.
Sioux Oil Co., Newcastle, Wyo. $2,886,100. 20,000,000 gallons.
Delta Refining Co., Memphis, Tenn. $2,247,926. 21,652,000 gallons.
Howell Refining Co., San Antonio, Tex. $1,547,218. 14,816,000 gallons.
Tesoro Petroleum Corp., San Antonio, Tex. $1,661,988. 15,300,000 gallons.
Crystal Flash Petroleum Co., Indianapolis, Ind. $1,483,523. 13,570,000 gallons.
Permian Corp., Houston, Tex. $1,468,870. 13,800,000 gallons.
Northwestern Refining Co., St. Paul Park, Minn. $1,155,156. 11,325,500 gallons.
Southland Oil Co., Yazoo City, Mass. $1,114,321. 10,180,000 gallons.
Delta Refining Co., Memphis, Tenn. $1,040,120. 10,328,000 gallons.
Howell Refining Co., San Antonio, Tex. $1,038,253. 10,185,000 gallons.

—Benton Dairy, Pensacola, Fla. $1,036,159. Three-month supply of milk and milk products for Fort Benning, Ga. Defense Personnel Support Center, Philadelphia, Pa.

28—Standard Oil Co. of California, San Francisco, Calif. $1,174,229. 8,079,960 gallons of RP-1 rocket fuel. Defense Fuel Supply Center, Alexandria, Va.

—Morris Fishman & Sons, Inc., Philadelphia, Pa. $1,561,079. 1,373,998 pounds of scoured carbonized wool. Defense Personnel Support Center, Philadelphia, Pa.

—J. Schoeneman, Inc., Owings Mills, Md. $1,021,500. 30,000 men's tropical wool-polyester coats. Defense Personnel Support Center, Philadelphia, Pa.

29—Rolane Sportswear, New York City, N.Y. $1,100,900. 114,300 raincoats. Defense Personnel Support Center, Philadelphia, Pa.

—Southern Athletic Co., Knoxville, Tenn. $1,826,000. 220,000 raincoats. Defense Personnel Support Center, Philadelphia, Pa.

—Tellico Mfg. Co., Tellico Plains, Tenn. $1,073,971. 141,700 raincoats. Defense Personnel Support Center, Philadelphia, Pa.

—Hunter Outdoor Products, Long Island City, N.Y. $2,544,600. 9,300 medium size general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—Winfield Mfg. Co., Winfield, Ala. $4,828,527. 847,110 pairs of men's cotton, wind-resistant poplin trousers. Defense Personnel Support Center, Philadelphia, Pa.

—Brownwood Mfg. Co., Dallas, Tex. $1,562,500. 250,000 pairs of men's cotton wind-resistant poplin trousers. Defense Personnel Support Center, Philadelphia, Pa.

ARMY

1—General Instrument Corp., S. W. Sickles Div., Chicopee, Mass. $1,505,760. 750-lb bomb fuzes. Chicopee. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Caterpillar Tractor Co., Peoria, Ill. $2,313,664. Industrial tractors. Peoria. Army Tank Automotive Center, Warren, Mich.

—FMC Corp., San Jose, Calif. $2,573,814. Self-propelled Hawk guided missile equipment carriers. San Jose. Army Tank Automotive Center, Warren, Mich.

3—Bell Helicopter Co., Fort Worth, Tex. $1,241,009. UH-1 aircraft scissor and sleeve assemblies. Fort Worth. Aviation Materiel Command, St. Louis, Mo.

—Hughes Tool Co., Culver City, Calif. $1,426,000. TH-55A helicopters. Culver City. Army Aviation Materiel Command, St. Louis, Mo.

—Chamberlain Corp., Waterloo, Iowa. $1,178,635. 2.75-inch rocket ammunition metal parts. Waterloo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Great Lakes Dredge & Dock Co., New Orleans, La. $1,896,807. Flood control work on the Mississippi River and its tributaries (Louisiana Project). St. Martin's Parish, La. Engineer Dist., New Orleans, La.

4—Philco Corp., Palo Alto, Calif. $1,000,000. Classified research and development. Palo Alto. Army Electronics Command, Fort Monmouth, N.J.

—TRW, Inc., Redondo Beach, Calif. $1,500,-000. Classified electronics equipment. Redondo Beach. Army Electronics Command, Fort Monmouth, N.J.

—AVCO Corp., Stratford, Conn. $1,073,611. Increased facilities to permit additional production of T-53 engines and UH-1 aircraft spare and repair parts. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—General Electric, Burlington, Vt. $1,531,-628. Armament pod spare parts and ground equipment. Burlington. Army Weapons Command, Rock Island Arsenal, Ill.

7—General Electric, Missile & Space Div., Philadelphia, Pa. $1,273,000. Additional effort on the ARPA Project GLOW research program (an optical instrumentation system). White Sands Missile Range, N.M. and Kwajalein Test Site. Army Missile Command, Huntsville, Ala.

—Pace Corp., Memphis, Tenn. $2,258,485. Illuminating ground signals. Memphis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Kaiser Jeep Corp., Toledo, Ohio. $2,630,-284. M606 ¼-ton utility trucks. Toledo. Army Tank Automotive Center, Warren, Mich.

—Philco Corp., Communication & Electronics Div., Philadelphia, Pa. $1,182,254. Expansion of the Integrated Wide Band Communication System training facilities at Fort Monmouth, N.J. Army Electronics Command, Fort Monmouth, N.J.

8—Page Communications Engineer, Inc., Washington, D.C. $6,068,053. Services for the IWCS (Integrated Wide Band Communication System) facilities at Fort Monmouth, N.J. Army Electronics Command, Fort Monmouth, N.J.

—Gregg, Gibson & Gregg, Inc., Leesburg, Fla. $4,101,047. Work on the Cross Florida Barge Canal Project. Putnam and Marion Counties, Fla. Engineer Dist., Jacksonville, Fla.

9—Wisconsin Motor Corp., Milwaukee, Wis. $1,518,300. Engines. Milwaukee. Army Mobility Equipment Command, St. Louis, Mo.

—RCA, Burlington, Mass. $9,794,777. Mobile test support equipment for various missile systems. Burlington. Army Missile Command, Huntsville, Ala.

—Brunswick Corp., Marion, Va. $1,200,088. Ordnance. Marion and Sugar Grove, Va. Edgewood Arsenal, Md.

10—Sperry Rand Corp., Phoenix, Ariz. $1,444,-000. Gyro magnetic compass sets and ancillary items. Phoenix. Army Electronics Command, Fort Monmouth, N.J.

—Hanson Machinery Co., Tiffin, Ohio. $1,-224,871. Truck mounted cranes. Tiffin. Army Mobility Equipment Center, St. Louis, Mo.

—Philco—Ford Corp., Newport Beach, Calif. $9,860,400. 1967 production of data and control sets for the Shillelagh missile system. Lawndale, Calif. Army Missile Command, Huntsville, Ala.

—Beaver State Contractors, Eugene, Ore. $2,421,535. Work on the Heise-Roberts Flood Control Project. Rexburg, Ore. Engineer Dist., Walla Walla, Wash.

—General Motors, Detroit, Mich. $1,128,092. Starter assemblies for 2½ and 5 ton trucks. Anderson, Ind. Army Tank Automotive Center, Warren, Mich.

—Honeywell, Inc., Hopkins, Minn. $5,822,-772. Bomb components. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—AVCO Corp., Stratford, Conn. $20,605,425. Modification of T-53-L-13 and T-53-L-11A engines for UH-1 aircraft. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

14—High Standard Mfg. Corp., Hamden, Conn. $2,884,255. M1A1, M2 and M3, 30 cal. carbine parts. Hamden. Procurement Detachment, New York City, N.Y.

—Philco Corp., Philadelphia, Pa. $2,600,000. Expansion of IWCS (Integrated Wide Band Communications System) in Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

—Page Communications Engineers, Washington, D.C. $9,230,000. Expansion of IWCS in Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

—Pathman Construction Co., Chicago, Ill. $2,824,727. Construction of a composite dining hall and dormitory at Chanute AFB, Ill. Engineer Dist., Chicago, Ill.

15—Pace Corp., Memphis, Tenn. $1,245,860. Smoke canisters. Camden, Ark. Edgewood Arsenal, Md.

—Norris Thermador Corp., Los Angeles, Calif. $1,361,260. Rehabilitation, repair and installation production equipment for ordnance. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Amron Corp., Waukesha, Wis. $[illegible]. 20mm projectiles. Waukesha. Frankford Arsenal, Pa.

—United Aircraft, Sikorsky Aircraft Div., Stratford, Conn. $1,697,613. Main gear box assemblies for CH-54 aircraft. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

16—Mohawk Rubber Co., Akron, Ohio. $1,[illegible],-734. Pneumatic tires for 1½ ton trailers and 2½-ton trucks. Akron. Army Tank Automotive Center, Warren, Mich.

—Mansfield Tire & Rubber Co., Mansfield, Ohio. $1,698,545. Pneumatic tires for 1½ ton trailers and 2½ ton trucks. Mansfield. Army Tank Automotive Center, Warren, Mich.

—Booz, Allen Applied Research, Inc., Chicago, Ill. $1,[illegible]. Scientific and technical effort in support of the Army Combat Development Institute of Combined Arms and Support. Chicago. [illegible] Procurement Agency, Chicago, Ill.

—Pacific Car & Foundry Co., Renton, Wash. $2,435,500. Engineering services for product improvement of M107 and M110 vehicles, and fabrication of test hardware sets. Renton. Northwestern Procurement Agency, Oakland, Calif.

—Dixie Contractors, Inc., Memphis, Tenn. $4,001,240. Work on the Verdigris River Project. Near Catoosa, Okla. Engineer Dist., Tulsa, Okla.

—United Aircraft, East Hartford, Conn. $1,-190,948. JFTD 12A [illegible] engines for CH-54A helicopters. East Hartford. Army Aviation Materiel Command, St. Louis, Mo.

—Boeing Co., Morton, Pa. $[illegible] CH-47B model helicopters, and [illegible] planning, procurement and [illegible] long lead time materials for additional CH-47B helicopters. Morton. Army Aviation Materiel Command, St. Louis, Mo.

17—Chamberlain Corp., Waterloo, Iowa. $2,-000,000. 105mm cartridge cases. Burlington, N.J. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Sylvania Electric Products, Inc., Mountain View, Calif. $[illegible]. Research and development in the field of [illegible] warfare. Mountain View. Army Electronics Command, Fort Monmouth, N.J.

—Stewart Warner Corp., Lebanon, Ind. $1,-113,000. 60mm projectile metal parts. Lebanon. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Bell Aerospace Corp., Hurst, Tex. $[illegible]. UH-1D helicopters for the Navy. Hurst. Army Aviation Materiel Command, St. Louis, Mo.

—Holt Bros., Stockton, Calif. $[illegible]. Generator sets. Stockton. Army Mobility Equipment Command, St. Louis, Mo.

18—General Motors, Anderson, Ind. $[illegible]. 12 volt storage batteries for vehicles. Anaheim, Calif. and New Brunswick, N.J. Army Tank Automotive Center, Warren, Mich.

—FMC Corp., South Charleston, W. Va. $1,-000,300. Armored [illegible] wheels. Los Angeles, Calif. and St. Marys, Ohio. Army Tank Automotive Center, Warren, Mich.

—AVCO Corp., Stratford, Conn. $[illegible]. T-55 engines for CH-47 helicopters. $[illegible]-950,000. T-55 L-7 engines for CH-47 helicopters. Stratford. Army Aviation Materiel Command, Warren, Mich.

—Studebaker Corp., Minneapolis, Minn. $1,-280,000. Design, fabrication and test of 60 KW generator sets. Minneapolis. Army Research & Development Lab, Fort Belvoir, Va.

—Philco—Ford Corp., Newport Beach, Calif. $1,920,000. Continuation of engineering services in support of the Chaparral Air Defense System. Anaheim, Calif. Army Missile Command, Huntsville, Ala.

21—Atlantic Research Corp., West Hanover, Mass. $1,861,008. Bomb fuses. West Hanover. Edgewood Arsenal, Md.

—Norris Thermador Corp., Everett, Mass. $6,117,140. 66mm high explosive antitank rocket launchers. Brockton, Mass. New York Procurement Detachment, Army Materiel Command.

—Firestone Tire & Rubber Co., Akron, Ohio. $9,488,746. Combat tank [illegible]. Noblesville, Ind. Army Tank Automotive Center, Warren, Mich.

—Goodyear Tire & Rubber Co., Akron, Ohio. $9,358,151. Combat tank components. St. Mary's Ohio. Army Tank Automotive Center, Warren, Mich.

—General Motors, Detroit, Mich. $2,421,-[illegible]. M551 diesel engines. Detroit. Army Tank Automotive Center, Warren, Mich.

22—Martin Marietta Corp., Orlando, Fla. $[illegible]. Instrumentation modification [illegible] in support of the Pershing weapons system. Orlando. Army Missile Command, Huntsville, Ala.

—Continental Motors, Muskegon, Mich. $[illegible]-241,900. Engine assemblies and components for V12 diesel engines for various vehicles. Muskegon. Army Tank Automotive Center, Warren, Mich.

—United Aircraft, Stratford, Conn. $4,3[illegible]-435. Gear box assemblies, rudder blades and main rotor blades. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—Brunswick Corp., Lincoln, Neb. $1,059,1[illegible]. Fuzes for 105mm projectiles. Lincoln. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Albion Malleable Iron Co., Albion, Mich. $2,[illegible]. 2.75-inch rocket metal parts. Albion. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Plymouth Industrial Products, Sheboygan, Wis. $1,512,500. M105A2 ammunition container assemblies. Plymouth, Mass. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Honeywell, Inc., Hopkins, Minn. $2,911,-442. Bomb fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Kisco Co., St. Louis, Mo. $1,197,490. 20mm cartridge containers, shipping and storage. St. Louis. Frankford Arsenal, Philadelphia, Pa.

23—General Dynamics, Rochester, N.Y. $1,-[illegible]. AN/GRC-106 radio sets. Rochester. Army Electronics Command, Philadelphia, Pa.

—Olin Mathieson Chemical Corp., East Alton, Ill. $1,[illegible]. Lead assemblies for [illegible] shells. Marion, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Vipond & Vipond, Inc., Hollidaysburg, Pa. $1,494,104. Work on the Union City Reservoir Project. Amity and Waterford, Pa. Engineer Dist., Pittsburgh, Pa.

—General Dynamics, San Diego, Calif. $1,-[illegible]. Work on a classified project. Davis Monthan AFB, Ariz. and San Diego. Army Security Agency, Arlington, Va.

—Norris Industries, Vernon, Calif. $3,018,-[illegible]. Metal parts for 152mm projectiles. Vernon. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Intercontinental Mfg. Co., Garland, Tex. $[illegible]. Metal parts for 105mm projectiles. Garland. Ammunition Procurement & Supply Agency, Joliet, Ill.

23—Canadian Commercial Corp., Washington, D.C. $1,324,517. Portable telephone sets. Camp Hill, New Brunswick, Canada. Army Electronics Command, Philadelphia, Pa.

—Hercules, Inc., Wilmington, Del. $11,400,-[illegible]. Propellant for 2.75-inch rockets. Lawrence, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Union Carbide Corp., New York City, N.Y. $[illegible]. Dry batteries for portable radio sets. [illegible], N.J. Army Electronics Command, Philadelphia, Pa.

25—Consolidated Box Co., Tampa, Fla. $1,-[illegible]. Fibre containers for ammunition. Tampa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Paper Tubes, Inc., Buffalo, N.Y. $1,084,612. Fibre containers for ammunition. Buffalo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—M. F. [illegible] Co., Alpha, N.J. $2,169,-[illegible]. Fibre containers for ammunition. Alpha. Ammunition Procurement & Supply Agency, Joliet, Ill.

—FMC Corp., Santa Clara, Calif. $1,619,976. Metal parts for 4.2-inch cartridges. Santa Clara. Ammunition Procurement & Supply Agency, Joliet, Ill.

—Ingraham Co., Bristol, Conn. $1,960,000. Metal parts for 4.2-inch mortar rounds. Bristol. Ammunition Procurement & Supply Agency, Joliet, Ill.

—American Bosch Arma Corp., Springfield, Mass. $7,239,157. Fuel pumps for 2½-ton and 5-ton trucks. Springfield. Army Tank Automotive Center, Warren, Mich.

—Bell Aerospace Corp., Fort Worth, Tex. $7,490,992. Drive shaft assemblies for UH-1 helicopters. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—Western Electric Co., Burlington, N.C. $1,-019,000. Gyroscopes for Nike Hercules missiles. Burlington. Army Missile Command, Huntsville, Ala.

—**Shaw Contractor & Builders**, Mt. Carmel, Ill. and **D. M. Blake Construction Co.**, Shelbyville, Ill. $1,167,465. Work on the Mt. Carmel Local Flood Protection Project. Mt. Carmel, Engineer Dist., Louisville, Ky.

—**Servel Co.**, Freeport, Ill. $1,765,450. Dry batteries for portable manpacked radio sets. Freeport. Army Electronics Command. Philadelphia, Pa.

—**Chrysler Corp.**, Detroit, Mich. $2,736,121. Engine assemblies with containers for ¾-ton trucks. Marysville, Mich. Army Tank Automotive Center, Warren, Mich.

30—**Bell Aerospace Corp.**, Fort Worth, Tex. (1) $3,669,266. Main rotor hub assemblies for UH–1 helicopters. (2) $5,137,266. Rotor blades, drive mechanism and components for AH–1G helicopters. (3) $1,369,969. Case assemblies, lever assemblies, shaft assemblies and fire wall assemblies for the UH–1 helicopter. $21,795,000. Cobra AH–1G helicopters. (5) $1,866,577. Rotor blades for the UH–1 helicopter. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

—**Gar-Let Mfg. Co.**, Philadelphia, Pa. $1,139,464. Cable assemblies for field telephones. Old Force, Pa. Army Electronics Command, Philadelphia, Pa.

—**Electrospace Corp.**, Glen Cove, N.Y. $1,254,730. Central office telephones, manual. Naguabo, Puerto Rico. Army Electronics Command, Philadelphia, Pa.

—**Olin Mathieson Chemical Corp.**, New York City, N.Y. $32,467,993. Propelling charges for artillery ammunition. Charlestown, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Day & Zimmerman, Inc.**, Philadelphia, Pa. $22,203,465. Artillery projectiles, fuzes and related components and O&MA activities. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Atlas Chemical Industries**, Wilmington, Del. $15,764,868. TNT. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Mason & Hanger, Silas Mason Co.**, New York City, N.Y. $11,093,262. Warheads and related ammunition components and O&MA activities. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Hercules, Inc.**, Wilmington, Del. $9,229,957. Miscellaneous propellants and explosives (Nike booster). Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Rohm & Haas Co.**, Philadelphia, Pa. $1,150,000. Propulsion research. Huntsville, Ala. Army Missile Command, Huntsville, Ala.

—**Honeywell, Inc.**, Hopkins, Minn. $1,525,278. Facilities to establish production capabilities for fuzes for the 40mm cartridge. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Chamberlain Corp.**, Waterloo, Iowa. $2,087,400. High explosive warheads for the 2.75-inch rocket, metal parts. Waterloo, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Gibbs Mfg. & Research Corp.**, Janesville, Wis. $1,381,380. Fuzes for the 2.75-inch rocket, metal parts. Janesville. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Lehigh, Inc.**, Easton, Pa. $1,695,792. High explosive warheads for the 2.75-inch rocket, metal parts. Easton. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Motors**, Anderson, Ind. $3,400,069. Batteries, 12-volt, type 2HM for ¼-ton and ¾-ton trucks. Anaheim, Calif. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Detroit, Mich. $1,352,692. 6V53 diesel engines with container, 6 cylinder, V type, 210 HP, in support of M113A1 vehicles family. Detroit. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Hudson, Ohio. $2,568,000. Trucks. Euclid, Ohio. Army Mobility Equipment Command, St. Louis, Mo.

—**Progressive Construction Co.**, Farmville, Va. $1,607,232. Maintenance and rehabilitation of Army Training Center and utilities. Fort Bragg. N.C. Engineer Dist., Savannah, Ga.

—**McDonnell Aircraft**, St. Louis, Mo. $3,000,000. Continued engineering development for the medium anti-tank assault weapons (MAW). Titusville, Fla. Army Missile Command, Huntsville, Ala.

—**Boeing Co.**, Morton, Pa. $2,125,949. Rotor wing blades for— CH–47 aircraft. Morton. Army Aviation Materiel Command, St. Louis, Mo.

—**Minnesota Mining & Mfg. Co.**, Rochester, Minn. $2,349,121. Periscopes and tank periscope mounts for use with the armored reconnaissance airborne assault vehicle (General Heridan). Rochester. Frankford Arsenal, Philadelphia, Pa.

—**Canadian Commercial Corp.**, Ottawa, Canada. $4,000,000. Radio sets and ancillary items. Montreal, Quebec, Canada. Army Electronics Command, Fort Monmouth, N.J.

—**Raytheon Co.**, Norwood, Mass. $2,000,000. Multiplexer and ancillary items. Norwood, Mass. Army Electronics Command, Fort Monmouth, N.J.

—**General Dynamics**, Rochester, N.Y. $1,823,409. Components of shelterized radio sets mounted on a truck. Rochester. Army Electronics Command, Philadelphia, Pa.

—**Machlett Laboratories**, Springdale, Conn. $10,000,000. A classified quantity of image intensifier assembly. Springdale. Army Electronics Command, Fort Monmouth, N.J.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $4,369,800. 20mm high explosive incendiary projectile metal parts and special tooling. Torrance. Frankford Arsenal, Philadelphia, Pa.

NAVY

1—**LTV Aerospace Corp., LTV Vought Aeronautics Div.**, Dallas, Tex. $2,095,000. Services and material to extend the service life and incorporate improvement changes on F-8D aircraft. Dallas. Naval Air Systems Command.

—**Motorola, Inc.**, Scottsdale, Ariz. $1,886,780. Development of a target detecting device for the fusing system of missiles. Scottsdale. Navy Purchasing Office, Los Angeles, Calif.

2—**Williamette Iron & Steel Co.**, Portland, Ore. $1,637,761. Regular overhaul of the landing ship, dock, USS Fort Marion (LSD–22). Portland. Industrial Manager, Thirteenth Naval District.

—**Sanders Associates, Inc.**, Nashua, N.H. $1,000,000. Continued development of an air droppable ASW sonobuoy system. Nashua. Naval Air Systems Command.

—**RCA, David Sarnoff Research Center, Astro Div.**, Princeton, N.J. $2,500,000. Six Navy navigation satellites. Princeton. Special Projects Office.

—**LFE Electronics**, Boston, Mass. $1,649,030. Electronic altimeters. Boston. Naval Air Systems Command.

—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $6,064,400. Classified services. Sunnyvale. Special Projects Office.

—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $8,684,138. Support of the Polaris missile program. Sunnyvale. Special Projects Office.

3—**North American Aviation**, Columbus, Ohio. $1,765,000. Installment funding for the Condor missile. Columbus. Naval Air Systems Command.

—**North American Aviation**, Columbus, Ohio. $8,989,993. T–2B aircraft and related equipment. Columbus. Naval Air Systems Command.

4—**Lenkurt Electric Co.**, San Carlos, Calif. $1,050,488. Electronic equipment. San Carlos. Navy Purchasing Office, Washington, D.C.

—**Rea Construction Co.**, Charlotte, N.C. $4,292,000. Modernization of Drydock No. 2 at the Naval Shipyard, Charleston, S.C. Southeast Div., Naval Facilities Engineering Command.

7—**Entwistle Mfg. Corp.**, Cranston, R.I. $10,858,890. Catapults and launch spares for launching aircraft. Cranston. Naval Air Engineering Center, Philadelphia, Pa.

8—**General Electric**, Philadelphia, Pa. $2,290,000. Catapult engine power plant assemblies and spare parts kits for launching aircraft. Cincinnati, Ohio. Naval Air Engineering Center, Philadelphia, Pa.

—**American Electronic Laboratories**, Colmar, Pa. $1,994,075. Development of an airborne UHF radio receiver-transmitter pod. Colmar. Naval Air Systems Command.

9—**Bethlehem Steel Corp.**, Terminal Island, Calif. $1,789,048. Topside overhaul of the oiler USS Chemung (AO–30). Terminal Island. Industrial Manager, 11th Naval Dist.

10—**United Aircraft**, East Hartford, Conn. $16,064,529. TF33–P–7 engines for the Air Force. East Hartford. Naval Air Systems Command.

—**McDonnell Aircraft**, St. Louis, Mo. $1,278,400. Spare parts in support of landing gear components for F4J aircraft, St. Louis. Naval Aviation Supply Office, Philadelphia, Pa.

—**Allen M. Campbell Co.**, Tyler, Tex. $5,898,000. Construction of a Force Troops Complex, at the Marine Corps Base, Camp Lejeune, N.C. Atlantic, Div., Naval Facilities Engineering Command.

—**Seatrain Lines**, Edgewater, N.J. $106,000,000. Use of 12 ships in the movement of military cargoes. Military Sea Transportation Service.

14—**Harvell Kilgore Corp.**, Toone, Tenn. $9,866,208. MK24, MOD 3 aircraft parachute flares. Toone. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—**Northrop Corp.**, Asheville, N.C. $14,106,500. MK24, MOD 3 aircraft parachute flares. Asheville. Navy Ships Parts Control Center, Mechanicsburg, Pa.

15—**Sylvania Electronics Systems**, Waltham, Mass. $1,029,750. Airborne receiver transmitter radio sets and related equipment. Waltham. Naval Air Systems Command.

—**McDonnell Aircraft Corp.**, St. Louis, Mo. $45,400,000. F–4E and RF–4C aircraft for the Air Force. St. Louis. Naval Air Systems Command.

—**Plastoid Corp.**, Hamburg, N.J. $3,377,389. Shielded electrical cable for shipboard use. Hamburg. Navy Electronics Supply Office, Great Lakes, Ill.

16—**Bethlehem Steel Corp.**, Bethlehem, Pa. $1,409,621. MK42 gun barrel liners and tubes. Bethlehem. Naval Ordnance Plant, Louisville, Ky.

—**Teledyne, Inc., Sewart Seacraft Div.**, Berwick, La. $1,109,890. Construction of five 85-foot patrol boats. $2,127,397. Construction of 13 65-foot boats for various purposes. Berwick. Naval Ship Systems Command.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $3,900,768. Airborne communication, navigation, identification systems and components. Cedar Rapids. Naval Air Systems Command.

—**ITT Federal Laboratories**, Nutley, N.J. $1,709,960. Airborne receiver-transmitters. Nutley. Naval Air Systems Command.

—**Sparton Corp.**, Jackson, Mich. $6,687,123. Production of sonobuoys. Jackson. Naval Air Systems Command.

—**Pennsylvania State University, Ordnance Research Laboratory**, University Park, Pa. $7,680,000. Work on MK48 torpedoes. University Park. Naval Ordnance Systems Command.

—**Johns Hopkins University, Applied Physics Laboratory**, Silver Spring, Md. $2,023,348. To increase the scope of the contract for the Bumblebee weapon system and associated ordnance tasks. Silver Spring. Naval Ordnance Systems Command.

17—**Gunderson Brothers Engineering Corp.**, Portland, Ore. $3,204,480. Construction of landing craft. Portland. Naval Ship Systems Command.

—**Bendix Corp.**, Teterboro, N.J. $4,821,900. Components of the AN–ASN–39 navigational computer set for F–4J aircraft. Teterboro. Naval Aviation Supply Office, Philadelphia, Pa.

—**Marinette Marine Corp.**, Marinette, Wis. $3,240,000. Construction of landing craft. Marinette. Naval Ship Systems Command.

—**General Precision, Inc.**, Clifton, N.J. $4,004,936. Airborne navigational computer sets. Clifton. Naval Air Systems Command.

—**Magnavox Co.**, Fort Wayne, Ind. $2,168,877. Modification kits for airborne radar sets. Fort Wayne. Naval Air Systems Command.

—**Sundstrand Corp.**, Rockford, Ill. $2,572,845. Constant speed drives and frequency control boxes. Rockford. Naval Air Systems Command.

—**LTV Aerospace Corp.**, Dallas, Tex. $32,000,000. A–7B aircraft. Dallas. Naval Air Systems Command.

18—**Curtiss Wright Corp.**, Wood-Ridge, N.J. $1,176,362. R3350 engine components for A1E and A1H aircraft. Wood-Ridge. Naval Aviation Supply Office, Philadelphia, Pa.

21—**Lear Siegler, Inc.**, Grand Rapids, Mich. $3,528,183. Loft bomb computer systems. Grand Rapids. Naval Air Systems Command.

—**Collins Radio Co.**, Cedar Rapids, Iowa. $5,593,068. Airborne UHF radio sets. Cedar Rapids. Naval Air Systems Command.

—**United Aircraft**, East Hartford, Conn. $3,067,802. J–60–P–6 engines for the Navy. East Hartford. Naval Air Systems Command.

—**Genge Industries**, Port Hueneme, Calif. $6,172,783. Design and design documentation on experimental, developmental and prototype military ordnance equipment. Ridgecrest, Calif. Navy Purchasing Office, Los Angeles, Calif.

Greenhut Construction Co., Pensacola, Fla. $1,688,008. Construction of a general training building at Keesler AFB, Miss. Gulf Div., Naval Facilities Engineering Command.

22 Bendix Corp., Teterboro, N.J. $1,369,660. Components of the PB20 automatic flight control system used on A-4F aircraft. Teterboro, N.J. and North Hollywood, Calif. Naval Aviation Supply Office, Philadelphia, Pa.

Philco-Ford Corp., Fort Washington, Pa. $1,363,000. Technical professional services of electronics field engineers. Naval Ship Systems Command.

Teledyne Systems Corp., Hawthorne, Calif. $4,000,000. Self-contained navigation systems. Hawthorne. Naval Air Systems Command.

26 Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y. $15,400,000. A-6A aircraft. Bethpage. Naval Air Systems Command.

Worthington Corp., Harrison, N.J. $1,080,920. Air compressors and related engineering services. Buffalo, N.Y. Naval Ship Systems Command.

28 Hatfield Industries, Carrollton, Tex. $1,394,736. Manufacture, assembly and checkout of Talos missiles. Carrollton. Naval Ordnance Systems Command.

Packard-Bell Electronics Corp., Newbury Park, Calif. $1,600,938. AN/ASM-[illegible] sets used to test radios installed in A-6A and E-2A aircraft. Newbury Park. Naval Aviation Supply Office, Philadelphia, Pa.

29 Lockheed Missiles & Space Co., Sunnyvale, Calif. $12,605,000. Classified research and development work on the Polaris missile system. Sunnyvale. Special Projects Office.

North American Aviation, Anaheim, Calif. $9,844,670. Development, testing, and furnishing of five prototype Ships Inertial Navigation Systems. Anaheim. Naval Ship Systems Command.

Norris Industries, Los Angeles, Calif. $4,820,260. Steel cartridge cases. Los Angeles. Ship Parts Control Center, Mechanicsburg, Pa.

Standard Kollsman Industries, Elmhurst, N.Y. $1,087,153. Fuzes and components of 5-inch/38 cal. gun ammunition. Melrose Park, Ill. Naval Ammunition Depot, Crane, Ind.

Hatfield Industries, Carrollton, Tex. $1,653,042. Bomb (MK 83) fin assemblies and crates. Carrollton. Ships Parts Control Center, Mechanicsburg, Pa.

R. F. Communications, Rochester, N.Y. $1,667,109. Single-sideband radio equipment for use aboard naval ships. Rochester. Naval Ship Systems Command.

Meadow Gold Dairies, Honolulu, Hawaii. $1,270,710. Milk and dairy products. Naval Supply Center, Pearl Harbor, Hawaii.

Intercontinental Mfg. Co., Garland, Tex. $6,793,830. Bomb bodies (MK 84). Garland. Ships Parts Control Center, Mechanicsburg, Pa.

30 Motorola, Inc., Chicago, Ill. $1,398,668. Bathythermograph transmitter sets. Chicago. Naval Air Systems Command.

Sparton Corp., Jackson, Mich. $1,657,261. Sonobuoys. Jackson. Naval Air Systems Command.

Magnavox Co., Fort Wayne, Ind. $6,067,870. Sonobuoys. Fort Wayne. Naval Air Systems Command.

Sanders Associates, Inc., Nashua, N.H. $1,805,477. Sonobuoys. Nashua. Naval Air Systems Command.

Otis Elevator Co., Brooklyn, N.Y. $3,691,930. Sonobuoys. Brooklyn. Naval Air Systems Command.

MARINE CORPS

1 Goodyear Tire & Rubber Co., Akron, Ohio. $1,894,721. Eleven-inch nylon purchase tape to be used in the aircraft arresting gear of the Marine Corps short airfield for tactical support system. Akron. Headquarters, Marine Corps.

14 Collins Radio Co., Cedar Rapids, Iowa. $3,767,690. Procurement of AN/PRC-47 radio sets and related equipment. Cedar Rapids. Headquarters, Marine Corps.

Standard Mfg. Co., Dallas, Tex. $1,398,623. Production of air-launched weapons loaders. Dallas. Headquarters, Marine Corps.

28 FMC Corp., San Jose, Calif. $1,272,562. Production of additional road wheel assemblies for amphibian tractors. San Jose. Headquarters, Marine Corps.

AIR FORCE

1 Continental Aviation & Engineering Corp., Detroit, Mich. $1,276,550. Production of J-69 engines for drone target aircraft. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

AiResearch Mfg. Co., Phoenix, Ariz. $1,250,300. Production of gas turbine compressors. Phoenix. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

Philco Corp., Fort Washington, Pa. $1,150,000. Operation and maintenance of the precision measurement laboratory at the Western Test Range, Vandenberg AFB, Calif. Air Force Western Test Range, Vandenberg AFB, Calif.

General Motors, Indianapolis, Ind. $[illegible]. Production of turbine blades for [illegible] engines. Indianapolis. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

2 Hughes Aircraft, Culver City, Calif. $[illegible]. Engineering and [illegible] of components [illegible] fire control system. Culver City. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

Fairchild Hiller Corp., Farmingdale, N.Y. $[illegible]. Engineering and production of modification kits and [illegible] for [illegible] aircraft. Farmingdale. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

Bendix Corp., South Bend, Ind. $[illegible]. Overhaul and modification of [illegible] components. South Bend. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

3 TRW, Inc., Redondo Beach, Calif. $[illegible]. Work on a space program. Redondo Beach. Space Systems Div., (AFSC), Los Angeles, Calif.

North American Aviation, Anaheim, Calif. $1,604,467. Procurement of spare parts for the Minuteman weapon system. Anaheim. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

Litton Systems, Woodland Hills, Calif. $[illegible]. Production of components for the [illegible] system on the [illegible] aircraft. Woodland Hills. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

General Dynamics, Fort Worth, Tex. $1,[illegible]. Studies relating to an advanced manned strategic aircraft. Fort Worth. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

General Electric, West Lynn, Mass. $[illegible]. Production of [illegible] engines for CH-3 and CH-3 helicopters. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Hallicrafters Co., Chicago, Ill. $[illegible]. [illegible] electronic countermeasures systems. Chicago. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

4 General Electric, West Lynn, Mass. $[illegible]. Production of J-85 engines for F-5 aircraft. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Wichita, Kan. $[illegible]. Fatigue testing of B-52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

7 Fairchild Hiller Corp., Hagerstown, Md. $[illegible]. Modification of C-123 aircraft. Hagerstown. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

Federal Electric Corp., [illegible], Wash. $[illegible]. Generator sets. [illegible]. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

Lear Siegler, Inc., Santa Monica, Calif. $1,145,[illegible]. Production of components for aircraft flight control systems. Santa Monica. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

8 Teletype Corp., Skokie, Ill. $[illegible]. Production of teletype machines. Skokie. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

Bendix Corp., Teterboro, N.J. $1,[illegible]. Production of spare parts for [illegible] navigation systems. Teterboro. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

9 Boeing Co., Morton, Pa. $1,[illegible]. Research and development of helicopter rotor blades. Morton. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

Lear Siegler, Inc., Grand Rapids, Mich. $2,[illegible]. Gyroscope instruments for aircraft. Grand Rapids. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Mitre Corp., Bedford, Mass. $8,49[illegible]. Research and development in the field of command and control systems. Bedford. Electronic Systems Div., (AFSC), L.G. Hanscom Field, Mass.

10 North American Aviation, Anaheim, Calif. $[illegible]. Production of guidance and control systems for Minuteman II missiles. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

Lockheed Aircraft, Lake Charles, La. $[illegible]. Modification inspection and repair of [illegible] aircraft. Lake Charles. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

Canoga Electronics Corp., Torrance, Calif. $[illegible]. Production of closed circuit television weather briefing systems. [illegible]. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

Continental Aviation & Engineering Co., Detroit, Mich. $1,436,712. Production of J-[illegible] engines for T-37 aircraft. Toledo, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

North American Aviation, Los Angeles, Calif. $1,642,[illegible]. Studies applicable to an advanced manned strategic aircraft. Los Angeles. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Renton, Wash. $1,043,[illegible]. Studies applicable to an advanced manned strategic aircraft. Renton. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

General Motors, Indianapolis, Ind. $3,63[illegible]. Aircraft engine development work. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

15 General Motors, Indianapolis, Ind. $7,452,[illegible]. Production of T-56 turboprop engines and related equipment. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Rand Corp., Santa Monica, Calif. $6,000,[illegible]. Studies and research on aerospace [illegible]. Santa Monica. Air Force Office of Scientific Research.

17 Emerson Electric Co., St. Louis, Mo. $1,[illegible]. Development of an advanced aircraft radar antenna system. St. Louis. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

U.S. Rubber Co., Detroit, Mich. $2,070,276. Production of tires for F-100, F-102 and [illegible] aircraft. Detroit. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

18 North American Aviation, Canoga Park, Calif. $[illegible]. Production of Thor space booster rocket engines. Neosho, Mo. and Canoga Park. Space Systems Div., (AFSC), Los Angeles, Calif.

General Electric, West Lynn, Mass. $6,501,[illegible]. Production of J-85 engines for F-5 and T-38 aircraft. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

RCA, Moorestown, N.J. $1,010,000. Production of digital range tracking systems. Moorestown. Air Force Eastern Test Range, Patrick AFB, Fla.

21 Sylvania Electronic Products, Williamsville, N.Y. $[illegible]. Production of airborne electronic equipment. Williamsville. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

General Electric, Utica, N.Y. $3,800,105. Production of airborne electronic countermeasures equipment. Utica. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

22 Motorola, Inc., Scottsdale, Ariz. $1,425,000. Production of fuzes and related equipment for aircraft ordnance. Scottsdale. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Boeing Co., Seattle, Wash. $3,076,000. Modification of Minuteman Wing I, Great Falls, Mont. Ballistics Systems Div., (AFSC), Norton AFB, Calif.

25 Douglas Aircraft, Tulsa, Okla. $3,951,405. Modification and maintenance of B-52 aircraft. Tulsa. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

Bendix Corp., South Bend, Ind. $1,293,676. Production of aircraft brake assemblies. South Bend. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

Boeing Co., Wichita, Kan. $1,498,833. Modification and maintenance of B-52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

28 General Dynamics, San Diego, Calif. $1,[illegible]. Repair and modification of Atlas launch vehicles. San Diego. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—United Aircraft, East Hartford, Conn. $1,044,060. Work on the supersonic combustion ramjet program. East Hartford. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—Lockheed Aircraft, Marietta, Ga. $1,425,000. Modification of the integrated flight control for the XV-4A aircraft. Marietta. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—ITT, Nutley, N.J. $23,085,137. Production of airborn Loran navigation sets and related equipment, and for field engineering services. Nutley. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

29—Cornell Aeronautical Laboratory, Buffalo, N.Y. $1,748,600. Analysis and evaluation of penetration aids effectiveness. Buffalo. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—Boeing Co., Wichita, Kan. $11,327,895. Modification of B-52 aircraft. Wichita. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—Bendix Corp., Teterboro, N.J. $1,337,414. Production of aircraft flight instruments. Teterboro. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—Applied Technology, Inc., Palo Alto, Calif. $6,020,710. Production of airborne electronic equipment for fighter and reconnaissance aircraft. Palo Alto. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

30—Northrop Corp., Hawthorne, Calif. $5,278,082. Production of long lead time equipment for F-5 aircraft. Hawthorne. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—North American Aviation, Anaheim, Calif. $2,000,000. Maintenance and modification of Minuteman missile guidance and control equipment. Anaheim. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—Hughes Aircraft Co., Culver City, Calif. $1,161,191. Modification of Falcon air-to-air missiles. Culver City. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

U.S.-FRG Select Firms To Develop V/TOL and V/STOL Aircraft

The United States and the Federal Republic of Germany (FRG) have selected two firms to conduct the prototype definition phase in the joint development of Vertical Take-Off Landing/Short Take-Off Landing (VTOL/STOL) fighter aircraft, which could be procured for test and evaluation.

Republic Aviation, a division of Fairchild Hiller, Farmingdale, Long Island, N.Y., and the German firm Entwicklungstring-SUD of Munich, Germany, will perform the work under the direction of the System Program Office, jointly manned by U.S. and FRG personnel.

The decision to procure a test quantity of the prototype aircraft will await the completion of the studies expected late next year.

Lightning-Proof Fuel Cap Developed by U.S. Air Force

A lightning-proof aircraft fuel filler cap has been developed for the Air Force by the Systems Engineering Group at Wright-Patterson AFB, Ohio.

The new cap was tested with man-made lightning at the Lightning and Transients Research Institute, Minneapolis, Minn. The tests proved that the filler cap will not cause sparks inside the aircraft fuel tank when the cap is struck by lightning.

Because of the excellent path it provides to the external surfaces of the aircraft wing, the cap is not damaged by high electrical currents.

Special provisions have been made to seal the cap against high transient pressures resulting from a lightning strike. In addition, the parts of the cap inside the fuel tank are nonmetallic. These design features are essential in preventing arcing inside the fuel tank.

The new fuel filler cap is interchangeable with many of the caps now used on aircraft. It will provide an added degree of safety to both military and civilian aircraft fuel systems.

Maverick Contract Definition Phase Contractors Selected

The Air Force has selected the Hughes Aircraft Co. of Culver City, Calif. and North American Aviation of Columbus, Ohio, to proceed with the contract definition phase of the Maverick (AGM-65A) air-to-ground missile program.

Contracts valued at about $3 million will be awarded to both companies for the work. The purpose of the contract definition phase is to verify the preliminary Maverick design and engineering, and to provide information necessary to award a definitive contract for development and production.

The Maverick is planned as a nonnuclear air-to-ground missile for use with the F-111A, A-7D and F-4 aircraft.

The Maverick program is managed by the Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

(Amounts in Thousands)

	July-Sept. 1966	July-Sept. 1965
Procurement from All Firms	$10,564,813	$7,495,407
Procurement from Small Business Firms	2,042,902	1,474,261
Percent Small Business	19.3	19.7

Zero Defects Awards Program Included in Amended Instruction

A Zero Defects Awards Program for contractors of the Defense Department has been incorporated into DOD Instruction 4155.12, "DOD Zero Defects Program."

The program consists of Participation, Achievement and Craftsmanship Awards. These awards are designed to recognize those contractors who participate in the DOD-sponsored Zero Defects program and demonstrate significant progress and achievements in meeting contractor-established performance goals.

Guidelines and criteria for meeting eligibility requirements for receiving the three levels of Zero Defects awards are detailed in the inclosure to the amended instruction.

Civil Works Projects

(Continued from Page 24)

chloride pollution; expansion of water quality monitoring program; hydrological investigations. $46,400,000.

WASHINGTON

Skagit River. (FC) Channel, levee and recreation improvements. $5,804,000.

WEST VIRGINIA

West Fork River. (MP) Stonewall Jackson Reservoir. $34,500,000.

NAVIGATION SURVEYS

Great Lakes (particularly Lake Ontario and Lake Erie).

Mexico Beach, Fla.

FLOOD CONTROL SURVEYS

Watershed and streams of Alaska, Hawaii, Puerto Rico, the Virgin Islands, and the Mississippi River below Cairo, Ill.

Watersheds and streams draining into: Great Lakes and St. Lawrence River (within the United States), and the Gulf of Mexico (along Texas coastline excluding the Rio Grande River).

Arkansas, White and Red Rivers and tributaries (excluding their drainage lying in the alluvial valley of the Mississippi River).

Cibolo Creek, Presido, Tex.

Great South Bay, N.Y.

Pacific Palisades Area at and in the vicinity of Los Angeles County, Calif.

Souris River and Red River of the north and tributaries (including adjacent streams in Minnesota draining into Canada).

Spring Valley Creek, Sweetwater River, Calif.

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Celestial-Inertial Lab Planned for Holloman AFB in 1967

A super-precision test laboratory that will resemble a planetarium is in the planning stages at the Air Force Systems Command's Missile Development Center, Holloman AFB, N. M. With construction requested for FY 1967, the domed structure is intended to house the most advanced celestial-inertial guidance test equipment available for evaluating the guidance systems of our nation's military vehicles.

"Future military guidance systems will require automatic methods for identifying and tracking stars, planets, satellites, even the earth itself, with extreme accuracy," said Edgar B. Godley, chief of the Missile Development Center's Celestial-Inertial Branch, in explaining the need for this new test facility. "Likewise our measurements must be an order of magnitude more precise than the quantity we are evaluating," he continued.

The concept for future advanced evaluation was developed over the last six years by the center's Directorate of Guidance Test. To this planning has been added the results of a study made by the AC Electronics Division of General Motors Corp. for the main piece of test equipment which will be a polar-axis celestial simulator.

The polar-axis fixture, on which an entire celestial-inertial guidance system may be mounted for test purposes, will be driven "at minus earth rate" to maintain the fixed spatial position necessary for such tests. Surrounding this tracker platform, a domed structure will carry as many as five or six star simulators, as well as sun, moon and and planet simulators, for the purpose of subjecting the guidance system to tests free of either seismic or man-made disturbances.

The building, partly above ground and partly underground, will contain a natural celestial observatory as well as super-clean laboratories built around separate stable pads for this isolating effect. By the basic expedient of isolating the stable pad from seisms of all kinds and by driving the platform at minus earth rate exactly, the celestial-inertial system under test will be equivalently in free space, except for gravity.

The completion of the entire test complex, including laboratories for precise gyroscope and accelerometer tests, is planned for the fiscal year period 1969–1970.

USAF Awards SCRAMJET Contracts

The U.S. Air Force has awarded three study contracts for a high-altitude, hypersonic, SCRAMJET-powered cruise vehicle. Three contracts, totaling $900,000, were awarded to Lockheed-California Co., North American Aviation, Inc., and McDonnell Aircraft Corp.

SCRAMJET, an acronym for Supersonic Combustion Ramjet, is a revolutionary power plant being developed and tested for the Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio. The ramjet engine uses high speed air as a compressor and burns high-energy fuel to boost its speed into hypersonic ranges.

Under the study contracts, the contractors will develop vehicle design concepts and identify military missions to be performed by a SCRAMJET-powered vehicle. Phases of the 12-month contracts also include application studies to match vehicle and mission, determination of mission operational characteristics, and conduct of vehicle parametric studies to evaluate alternate designs for a hypersonic vehicle.

The work will be performed under the direction of the Deputy for Advanced Systems Planning, AFSC Aeronautical Systems Division, Wright-Patterson AFB. Capt. Richard J. Menna is project manager for the vehicle.